

KOPPERS

COAL TAR PITCH ROOFING

WATERPROOFING

DAMP-PROOFING

ROOF INSULATION

FLASHINGS

PLASTIPITCH PROTECTED METAL (Description only)

PROTECTIVE COATINGS (Description only)

Specifications

No. 49



KOPPERS
COMPANY
INC.

PITTSBURGH 19, PA.

SPECIFICATION INDEX

NEW CONSTRUCTION

Deck Construction		SLOPE of Deck	BOND in Years	Type of SURFACE	No. of PLIES	Spec. No.	Page No.
Wood	FLAT	0"-2"	20	Gravel or Slag	5	1	4
		0"-2"	15	Gravel or Slag	4	2	4
		0"-2"	10	Gravel or Slag	3	30	4
	STEEP	2"-5"	20	Slag	5	3	5
		2"-5"	15	Slag	4	25	5
		3"-9"	15	Mineral		31	6
		3"-9"	10	Mineral		4	6
Poured Concrete or Poured Gypsum	FLAT	0"-2"	20	Gravel or Slag	4	5	7
		Dead Level	20	Gravel or Slag	4	6	7
		0"-2"	15	Gravel or Slag	3	7	7
	STEEP	2"-5"	20	Slag	4	8	8
		2"-5"	15	Slag	3	32	8
		3"-9"	15	Mineral Surface		33	9
		3"-9"	10	Mineral Surface		9	9
Precast Concrete Slabs	FLAT	0"-2"	20	Gravel or Slag	4	10	10
		0"-2"	15	Gravel or Slag	3	11	10
Precast Gypsum, Gypsum Steel Plank	FLAT	0"-2"	20	Gravel or Slag	5	12	11
		0"-2"	15	Gravel or Slag	4	13	11
Precast Gypsum, Gypsum Steel Plank or Concrete Slab	STEEP	2"-5"	20	Slag	5	14	12
		2"-5"	15	Slag	4	26	12
		3"-9"	15	Mineral		34	13
		3"-9"	10	Mineral		35	13
Steel with insulation	FLAT	0"-1"	20	Gravel or Slag	4	17	14
		0"-1"	15	Gravel or Slag	3	18	14
	STEEP	1"-5"	20	Slag	4	19	15
		1"-5"	15	Slag	3	36	15
Promenade Tile over Poured Concrete	FLAT	0"-1"	20	Promenade Tile	5	20	16
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		0"-1"	15	Gravel or Slag	3	24	18

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Poured Concrete, Gypsum and Precast Concrete Slabs	Normal	202	21
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Steel	High	204	21

FLASHINGS

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Metal Cap and Base Flashing	None	100	23
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WATERPROOFING AND DAMPPROOFING

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KOPPERS

A Koppers Slag or Gravel Surfaced Roof consists of alternate layers of tarred felt cemented with pitch to form a continuous skin over the entire roof deck. While the actual waterproofing agent is the pitch, the felt gives an elasticity and tensile strength to the membrane which enables it to bridge cracks and joints, and to adjust itself to the expansion and contraction of the surface to which it is applied.

The number of layers or "plies" of tarred felt required varies from 3 to 5 and depends on the type of deck and the length of service desired. The number of plies used does not affect the impermeability of the roofing, but a greater number does prolong its life.

The pitch used may be either Koppers Coal-Tar Pitch, or Koppers Steep Roofing Pitch, depending on type or incline of the surface to which the roofing is applied. The first is superior for decks of slight incline because of its self-sealing characteristics; the second is ideal for steep roofs because of its ability to resist any tendency to creep due to gravity.

Either slag or gravel provides a satisfactory surface on decks of slight incline, but where steeper slopes are encountered, slag only should be used since its sharp and irregular surfaces enable it to retain a grip on the pitch and, therefore, not slide.

APPLICATION OF BUILT-UP ROOFING FELTS IN GENERAL.

All roofing is to be built up in place with alternate moppings and layers of felt over the proper preliminary work as specified in this book under the several sub-heads for various types of deck construction and slope. Application is to be made by experienced workmen only and in the manner hereinafter described and the finished roof is to consist of a number of plies and type of surfacing as specified under the proper sub-head in the specifications.

Apply the roofing so that the direction of the flow of water is over and not against laps. Roll or press all plies of felt into the hot pitch and lay without wrinkles, buckles or kinks, so that the finished roof is free from pockets or blisters. All moppings must completely cover the area to which they are applied so that no part of the surface to be covered shows through the moppings. Overlap ends of all connecting plies of felt not less than 10 inches.

The widths of felt are laid shingle fashion, not only because this method produces a stronger membrane but because it also makes it possible to construct a roof of any desired number of plies in a single progressive mopping. This is accomplished by varying the widths of the edge laps. Three-ply roofing, for example, is achieved by lapping each width approximately two-thirds over the preceding width; for 4 plies, a lap of approximately three-fourths the width is required.

SLAG OR GRAVEL SURFACED ROOFS

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KOPPERS FLAT ROOFS

ADVANTAGES OF COAL TAR PITCH FOR FLAT ROOFS

Two important questions should be asked about any roofing to be applied on flat decks:

1. Can it resist prolonged contact with water without deteriorating?
2. Does it have the ability to heal itself automatically?

Roofs built with Koppers Old Style Coal Tar Pitch and Approved Tarred Felt DO resist water and they DO heal themselves.

RESISTANCE TO WATER

1. Prolonged contact with water is a condition almost impossible to avoid on flat roofs. Poor drainage, low spots, or settlement of the building may cause it. Service records of 15 to 50 years by coal tar pitch roofs with little or no attention prove the resistance of tar to water. Koppers Old Style Pitch is practically insoluble in water. None of its constituents has more than a slight water solubility. Koppers Old Style Built-up Roofing is resistant to moisture and sunshine.

THE SELF-HEALING PROPERTY

2. Weathering and rapid changes in atmospheric conditions can cause cracks in the top surfaces of some types of roofing. However the vital consideration is whether these cracks are permanent if they do appear. Old Style Pitch has a property technically known as "cold flow" and even at ordinary temperatures cracks in the surface heal themselves. This can clearly be seen in photomicrographs which show the sides of the cracks moving slowly together until complete fusion takes place and the pitch again forms a continuous layer. Old Style Pitch Roofs readily conform to slight irregularities in the deck and yet remain waterproof.

THE EXTRA HEAVY TOP POURING

Additional protection is given a Koppers Roof by the extra heavy top of roofing pitch which is poured on (not mopped). This pouring amounts to approximately 75 pounds of pitch for every 100 square feet of roof surface.

THE GRAVEL OR SLAG SURFACE

The gravel or slag surface on a Koppers Roof provides an armor against hail, driving rain, sleet and snow. It also provides additional wearing surface which protects the roof against foot traffic. Roofs with gravel or slag surfaces cling to the deck even in severe wind storms.

THE EXTRA SATURATION OF THE FELT

The tarred felt used in Koppers Roofs absorbs one and one-half times its own weight of coal tar pitch during saturation. This large proportion of saturant insures high strength and maximum durability.

PRESERVATIVE AND NON-CORROSIVE ACTION

Koppers Old Style Pitch contains coal tar creosote, which is unsurpassed as a preservative for wood, felt or other materials which are used in roofing construction.

KOPPERS STEEP ROOFS

ADVANTAGES OF COAL TAR PITCH FOR STEEP ROOFS

Koppers Steep Roofing Pitch provides, for steep roofs (slopes of 2 to 5 inches per foot) the same long life, the same resistance to water and weather that have made coal tar pitch and tar-saturated felt the outstanding materials for flat built-up roofs.

On steep roofs constructed in accordance with Koppers specifications, the upper edge of every ply, laid shingle fashion, is nailed to the deck or the insulation, and thus mechanically anchored.

Before the development of steep roofing pitch, it was necessary to apply, on steep slopes, types of roofing which do not have the long service records established by coal tar pitch. This often caused a difficult situation on buildings where both steep and flat roofs were constructed, because bonds could be obtained by the owner on the coal tar pitch roofings on the flat areas, but not on the same type of roofing on the slopes. This difficulty is now eliminated, as roofing bonds can be obtained on Koppers Steep and Flat Built-up Roofings applied by Koppers Approved Roofing Contractors in territories covered by Koppers Roof Inspection Service.

Koppers Steep Roofing Pitch is approximately 30° F. harder than ordinary roofing pitch. It keeps the slag firmly embedded. It complies with the specifications of the Underwriters' Laboratories.

KOPPERS ROOF BONDS

Bonds on Koppers Roofing and Flashings are issued by Koppers Company, Inc., and the National Surety Corporation on roofs constructed according to Koppers specifications and when applied by roofing contractors approved in writing by Koppers Company, Inc. When Koppers Bonded Roofing with Koppers Bonded Flashings are specified, this company will have an inspector on the job to see that it is constructed according to the specifications. It is issued for 10, 15 or 20 years.

Note—Koppers Company, Inc., will issue Roofing Bonds in such portions of the United States as are covered by its inspection service.

GENERAL ROOFING INFORMATION

KOPPERS TARRED FELT

Koppers Tarred Felts are sold in standard size rolls, 36 inches wide and containing 432 square feet, except when otherwise specified. Koppers Approved Tarred Felt, the highest grade of roofing and waterproofing felt and the grade used in Koppers Bonded Roofs, has an approximate average weight of 15 lbs. per 108 square feet, or 60 pounds per roll.

KOPPERS OLD STYLE PITCH

Complies with the following standard specifications:

Federal Specifications R. P-381 Type I (Federal Specifications Board)—"Coal Tar Pitch for Built-up Roofing."

A.S.T.M. D-450 Type A.

Underwriters' Laboratories.

Koppers Old Style Pitch is sold in barrels or metal containers, 450 to 500 lbs.

UNDERWRITERS' LABORATORIES CLASS A RATING

Roofs constructed according to Koppers specifications, with slag or gravel surfaces, carry the Class A rating of the Underwriters' Laboratories.

KOPPERS

WOOD DECKS

Hot bitumen should never be applied directly to a wood deck. Sandwiched between the heat from above and the heat from below, such coating finds its way through the boards into the building. Good practice demands the cushioning and blotting effect of a layer of sheathing paper fol-

lowed by layers of dry felt. Shiplap and square edge boards should be avoided where possible. If the inside of the roof deck is exposed to air pressure created from open doors or windows, the tongue-and-grooved sheathing should be used.

FLAT ROOFS

GRAVEL OR SLAG SURFACE
MAXIMUM INCLINE: 2 IN. PER FT.
WOOD DECKS

20 year—5 ply—Spec. No. 1

15 year—4 ply—Spec. No. 2

10 year—3 ply—Spec. No. 30

SPECIFICATIONS

(Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

Do not apply roofing to any surface which is not reasonably smooth and free from projections or holes which might cause puncture of roofing membrane. Lumber shall be seasoned and dry. Immediately before the application of the roofing, thoroughly clean the surface of dust and all loose material.

Application of Roofing Materials

1st. Apply one (1) thickness of five (5) pound sheathing paper over the entire surface of the deck, lapping each sheet one (1) inch over the preceding sheet. Nail to hold in place.

2nd. (Spec. No. 1—20 year)
(Spec. No. 2—15 year)

Apply over the entire surface of the sheathing paper, two (2) dry plies of Koppers Approved Tarred Felt. Lap plies nineteen (19) inches. Nail as required to hold in place.

3rd. Mop with Koppers Old Style Pitch the entire surface, preceding the application of additional plies of felt and apply over the entire surface as follows:

4th. (Spec. No. 1—20 year)

Apply three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-thirds (24 $\frac{2}{3}$) inches.

Nail each sheet of felt with simplex flat head or one (1) inch barbed roofing nails through flat tin discs, two (2) inches from the upper edge on twenty-four inch centers. All laps shall be mopped the full width with Koppers Old Style Pitch so that in no place shall felt touch felt.

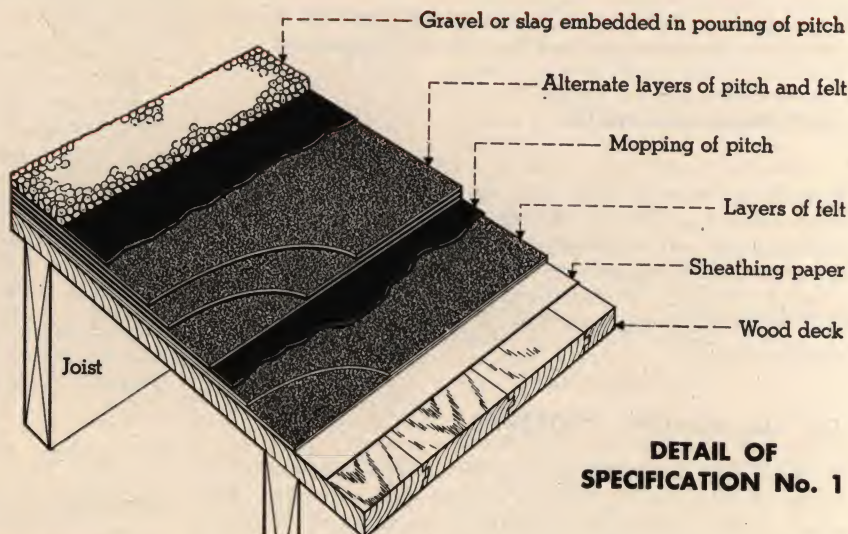
5th. Pour over the entire surface of the roofing membrane a uniform coating of approximately seventy-five (75) pounds of Koppers Old Style Pitch into which, while hot, embed not less than four

2nd. (Spec. No. 30—10 year)

Apply over the sheathing paper, one (1) dry ply of Koppers No. 30 Tarred Felt. Lap ply four (4) inches. Nail as required to hold in place.

4th. (Spec. No. 2—15 year)
(Spec. No. 30—10 year)

Apply two (2) plies of Koppers Approved Tarred Felt, lapping plies nineteen (19) inches.



DETAIL OF
SPECIFICATION No. 1

hundred (400) pounds of gravel or three hundred (300) pounds of slag for each one hundred (100) square feet. Slag or gravel shall be from one-fourth ($\frac{1}{4}$) to five-eighths ($\frac{5}{8}$) inches in size and shall be clean and dry.

General

Pitch shall not be heated above three hundred and seventy-five (375) degrees F. Tarred felt shall be laid without wrinkles or buckles.

Gravel or slag shall be applied within eight (8) days after application of felts. During freezing weather, all exposed felts shall be either immediately graveled or slagged in, or, if this is impossible, exposed felt surfaces shall be glazed with a mopping of pitch.

Material Required per 100 Sq. Ft.

MATERIAL	Spec. No. 1 (20 year)	Spec. No. 2 (15 year)	Spec. No. 30 (10 year)
Sheathing Paper	5 lbs.	5 lbs.	5 lbs.
Tarred Felt	75 lbs.	60 lbs.	60 lbs.
Pitch	150 lbs.	125 lbs.	125 lbs.
Gravel OR Slag	400 lbs. OR 300 lbs.	400 lbs. OR 300 lbs.	400 lbs. OR 300 lbs.

BRIEF SPECIFICATIONS

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 1 for 20 years, No. 2 for 15 years, No. 30 for 10 years) and requirements, and subject to Koppers inspection and approval. Upon completion of the work, the contractor is to furnish Koppers Roofing Bond to the owner.

FOR BONDED FLASHINGS, refer to pages 22-23.

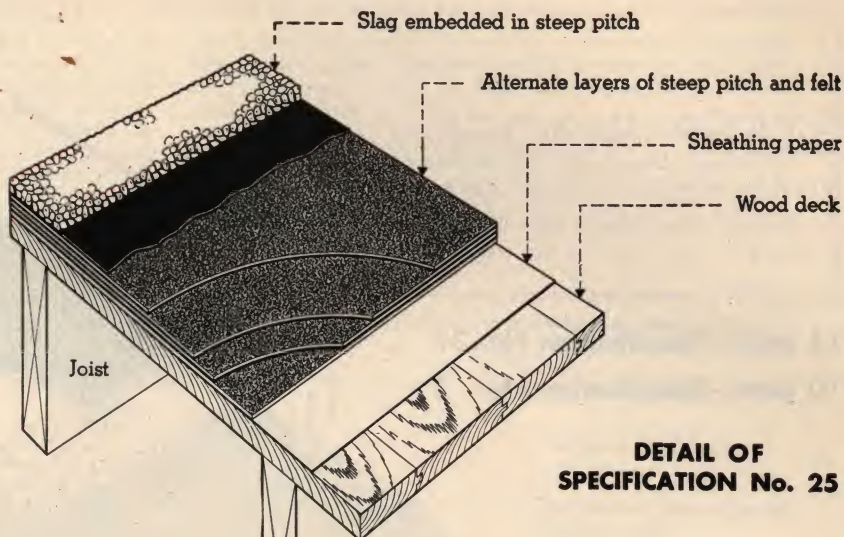
Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

STEEP ROOFS

SLAG SURFACE—WOOD DECK
MAXIMUM INCLINE: 5 IN. PER FT.
MINIMUM INCLINE: 2 IN. PER FT.

20 year—5 ply—Spec. No. 3

15 year—4 ply—Spec. No. 25



DETAIL OF
SPECIFICATION No. 25

SPECIFICATIONS (Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

Do not apply roofing to any surface which is not reasonably smooth and free from projections or holes which might cause puncture of roofing membrane. Lumber shall be seasoned and dry. Immediately before the application of the roofing, thoroughly clean the surface of dust and all loose material.

Application of Roofing Materials

1st. Apply one (1) thickness of five (5) pound sheathing paper over the entire surface of the deck, lapping each sheet one (1) inch over the preceding sheet. Nail to hold in place.

2nd. (Spec. No. 3—20 year)

Apply over sheathing paper, five (5) plies of Koppers Approved Tarred Felt at right angles to the incline of the roof, lapping each sheet twenty-nine (29) inches. Nail each ply of felt with one (1) inch barbed roofing nails through flat tin discs eight (8) inches from upper edge on twelve (12) inch centers. Mop solidly each lap of felt for a distance of twenty-seven (27) inches with Koppers Steep Pitch.

2nd. (Spec. No. 25—15 year)

Apply over the sheathing paper, four (4) plies of Koppers Approved Tarred Felt at right angles to the incline of the roof, lapping each twenty-seven and one-half (27½) inches. Nail each ply of felt with one (1) inch barbed roofing nails through flat tin discs, nine and one-half (9½) inches from the upper edge, on twelve (12) inch centers. Mop solidly each lap of felt for a distance of twenty-five and one-half (25½) inches with Koppers Steep Pitch.

Pitch moppings between plies of felt shall not extend beyond lower edge of overlying ply of felt, so that the finished felt surface is free of pitch. End strips shall not be applied over connecting plies of felt.

3rd. Pour or drip mop over the entire surface of the roofing membrane, a uniform coating of approximately sixty (60) pounds of Koppers Steep Pitch in which, while hot, immediately embed firmly not less than two hundred and seventy-five (275) pounds of clean, dry slag (three-sixteenth (3/16) to one-half (½) inch in size) for each one hundred (100) square feet. In cold weather, slag shall be heated and dry before being applied. The finished slag surface shall be broomed lightly to remove loose slag.

At all two way ridges, for a distance of nine (9) inches on each side, pour a coating of steep pitch over slag and embed a second layer of slag.

General

Steep Pitch shall not be heated above three hundred and seventy-five (375) degrees F., nor applied to roof at less than three hundred and twenty-five (325) degrees F. Tarred felt shall be laid without wrinkles or buckles. At junction of steep and flat roofing, the roofing on the flat surface is to be carried up the inclined surface not less than twenty-four (24) inches before the steep roofing is applied. Application of steep roofing shall start at the point of junction with the flat roof. Extend slag stops one and one-half (1½) inches above roof deck.

Material Required per 100 Sq. Ft.

MATERIAL	Spec. No. 3 (20 year)	Spec. No. 25 (15 year)
Sheathing Paper	5 lbs.	5 lbs.
Tarred Felt	75 lbs.	60 lbs.
Steep Pitch	140 lbs.	120 lbs.
Slag	275 lbs.	275 lbs.

BRIEF SPECIFICATION

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 3 for 20 years, No. 25 for 15 years) and requirements, and subject to Koppers inspection and approval.

Upon completion of the work, the contractor is to furnish Koppers Roofing Bond to the owner.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

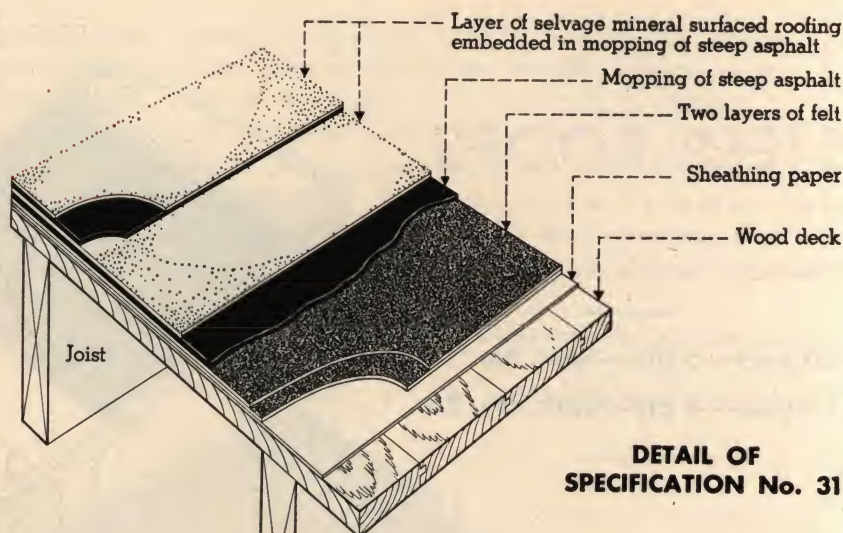
FOR BONDED FLASHINGS, refer to pages 22-23.

STEEP ROOFS

MINERAL SURFACE — WOOD DECKS
MAXIMUM INCLINE: 9 IN. PER FT.
MINIMUM INCLINE: 3 IN. PER FT.

15 year—Specification No. 31

10 year—Specification No. 4



DETAIL OF
SPECIFICATION No. 31

SPECIFICATIONS (Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

(Same as described for Specifications No. 3 and No. 25, on page 5.)

Application of Roofing Materials

1st. (Spec. No. 31—15 year)

A. Apply at right angles to incline of roof one (1) thickness of 5 pound sheathing paper over the entire surface of the deck, lapping each sheet one (1) inch over the preceding sheet. Nail to hold in place.

B. Apply at right angles to the incline of the roof over the sheathing paper, two (2) plies

of Koppers Approved Tarred Felt, lapping each sheet nineteen (19) inches. Mop back solidly each lap of tarred felt for a distance of seventeen (17) inches with Koppers Steep Asphalt.

Each ply of felt shall be nailed with one (1) inch barbed roofing nails through flat tin discs two (2) inches from upper edge on eighteen (18) inch centers.

1st. (Spec. No. 4—10 year)

Apply at right angles to the incline of the roof, one (1) ply of Koppers No. 33 Tarred Felt, lapping each sheet four (4) inches over the preceding sheet. Nail along upper edge on eighteen (18) inch centers.

2nd. Beginning at the low point, thoroughly mop a portion of the tarred felt surface with Koppers Steep Asphalt, into which, while hot, embed a sheet of selvage edge mineral surface roofing, this to run across the slope of the roof. Selvage should be on upper edge. Nail in double staggered course along selvage with one (1) inch barbed roofing nails through flat tin discs, kept two (2) inches from the mineral surfacing and twelve (12) inches o.c. for each course. Mop the selvage of the sheet just laid and the adjacent area of tarred felt surface with steep asphalt and into this, while hot, embed thoroughly the next sheet of mineral surfaced roofing, taking care that the lower edge meets the edge of the mineral surfacing of the sheet below. Nail as described for previous sheet. Repeat the process of laying sheets of mineral surfaced roofing shingle fashion until the entire area has been covered. Lap ends six (6) inches, nailing the underlying sheet with six (6) one (1) inch barbed roofing nails through flat tin discs, starting one (1) inch from the lower edge, spaced five (5) inches o.c. Coat the underside of mineral surfaced roofing at each end lap with Steep Asphalt and firmly embed in the surface of the underlying sheet. Carefully rub down edges.

General

Mineral surfaced roofing is to be cut in strips not exceeding twenty (20) feet in length prior to using, and is to be stacked flat for a sufficient time to permit these strips to become perfectly flat.

Tarred Felt and Mineral Surface Roofing shall be laid without wrinkles or buckles.

Steep Asphalt shall not be heated above four hundred (400) degrees F.

At junction of steep and flat roofing, the roofing on the flat surface is to be carried up the inclined surface not less than twenty-four (24) inches before steep roofing is applied. Application of steep roofing shall start at the point of junction with the flat roof.

Materials Required per 100 Sq. Ft.

MATERIAL	Spec. No. 31 (15 year)	Spec. No. 4 (10 year)
Red Rosin	5 lbs.	
Tarred Felt	30 lbs.	30 lbs.
Steep Asphalt	90 lbs.	60 lbs.
Selvage-edge Roofing	110 lbs.	110 lbs.

BRIEF SPECIFICATION

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 31 for 15 years, No. 4 for 10 years) and requirements and subject to Koppers inspection and approval. Upon completion of the work, the contractor is to furnish Koppers Roofing Bond to the owner.

NOTE: Koppers Company, Inc., will issue roofing bonds where roofing is applied according to Specifications No. 31 and No. 4, only when applied in connection with flat bonded Koppers Roofing.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

FOR BONDED FLASHINGS refer to pages 22-23.

POURED CONCRETE AND POURED GYPSUM DECKS

Poured concrete decks sometimes cause trouble because the built-up roofing is laid before the deck is thoroughly dry—such as might happen when the general contractor is anxious to get the building under cover and so urges the roofing contractor to begin work shortly after the deck has been poured. When this happens the result is a blistered and buckled membrane or, just as serious, insulation curls and makes an unsatisfactory job.

The roofing contractor, backed by the Architect, should insist on a thoroughly dry deck before beginning work. He should also

see to it that the deck is free of loose sand, frozen scale and other foreign matter. Projections should be removed, low points filled with cement grout or other suitable material, and all cracks pointed up.

A poured gypsum deck, especially, should be inspected for moisture content, the characteristic of this material being such that even after pouring it quickly takes on a dry appearance. The dryness, however, actually extends only a little distance below the surface, the large mass of the gypsum actually being very moist.

FLAT ROOFS

**GRAVEL OR SLAG SURFACE
MAXIMUM INCLINE: 2 IN. PER FT.
POURED CONCRETE AND
POURED GYPSUM DECKS**

(Also for wood decks where Koppers Insulation Specification No. 201 is used.)

(If Poured Gypsum Deck is not thoroughly dry, apply roofing according to Specification No. 12 for 20 year and No. 13 for 15 year.)

SPECIFICATIONS

(Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

Do not apply built-up roofing to any surface which is not reasonably smooth and free from projections or holes which might cause puncture of roofing membrane. Surfaces must be dry. Immediately before the application of the roofing, thoroughly clean the surface of dust and loose materials. Decks of inclines exceeding one (1) inch and less than two (2) inches to the foot shall permit nailing, or nailing strips must be set in the deck flush with its surface, these strips to be spaced three (3) feet apart and placed up and down and not across the slope of the roof.

Application of Roofing Materials

1st. (A) Over Poured Concrete: Mop deck completely with Koppers Old Style Pitch.

(B) Over Poured Gypsum: Strip mop the deck with two (2) foot wide moppings of Koppers Old Style Pitch, with one (1) foot of space between moppings.

2nd. (Spec. No. 5—20 year)

Apply over the entire surface, four (4) plies of Koppers Approved Tarred Felt, lapping plies twenty-seven and one-half (27½) inches.

Mop solidly between each 27½ inch lap with Koppers Old Style Pitch so that in no place shall felt touch felt.

2nd. (Spec. No. 7—15 year)

Apply over the entire surface three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-third (24⅔) inches.

Mop solidly between the 24⅔ inch lap with Koppers Old Style Pitch so that in no place shall felt touch felt.

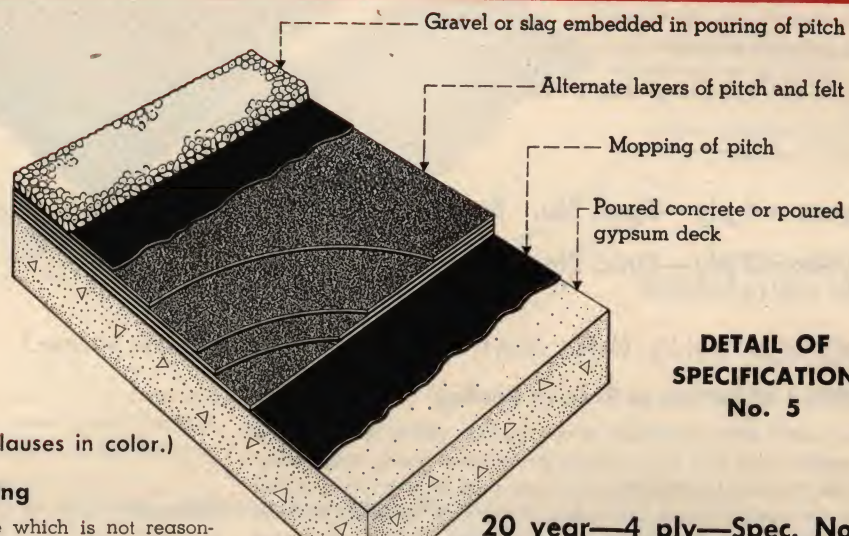
Where slope of deck is more than one (1) inch but less than two (2) inches per foot and deck permits nailing, nail along upper edge of sheet, nails to be spaced twenty-four (24) inches o.c. Where nailing strips are installed, nail each ply of felt with one (1) inch barbed roofing nails through flat tin discs three (3) inches from upper edge on three (3) foot centers.

2nd. (Spec. No. 6—20 year)

Apply over the entire surface, two (2) plies of Koppers Approved Tarred Felt, lapping plies nineteen (19) inches, mopping solidly between each 19 inch lap with Koppers Old Style Pitch so that in no place shall felt touch felt.

Mop the entire surface of the first two plies of felt.

Apply over the entire surface two (2) plies of Koppers Approved Tarred Felt, lapping plies nineteen (19) inches, mopping solidly between the 19 inch lap with Koppers Old Style Pitch so that in no case shall felt touch felt.



**DETAIL OF
SPECIFICATION
No. 5**

20 year—4 ply—Spec. No. 5

20 year—4 ply—Spec. No. 6
(for Dead Level Decks)

15 year—3 ply—Spec. No. 7

3rd. Pour over the entire surface of the roofing membrane a uniform coating of approximately seventy-five (75) pounds of Koppers Old Style Pitch, in which, while hot, embed not less than four hundred (400) pounds of one-quarter (¼) to five-eighth (⅝) inch clean dry gravel or three hundred (300) pounds of slag for each one hundred (100) square feet.

General

Pitch shall not be heated above three hundred seventy-five (375) degrees F. Tarred felt shall be laid without wrinkles or buckles.

Gravel or slag shall be applied within eight (8) days after application of felts. During freezing weather, all exposed felts shall be either immediately graveled or slagged in, or, if this is impossible, exposed felt surfaces shall be glazed with a mopping of pitch.

Materials Required per 100 Sq. Ft.

MATERIAL	Spec. No. 5 (20 year)	Spec. No. 6 (20 year)	Spec. No. 7 (15 year)
Pitch	200 lbs.	200 lbs.	175 lbs.
Felt	60 lbs.	60 lbs.	45 lbs.
Gravel	400 lbs.	400 lbs.	400 lbs.
OR	OR	OR	OR
Slag	300 lbs.	300 lbs.	300 lbs.

BRIEF SPECIFICATION

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 5 for 20 years, No. 6 for 20 years on dead level deck, No. 7 for 15 years) and requirements, and subject to Koppers inspection and approval. Upon completion of the work the contractor is to furnish Koppers Roofing Bond to the owner.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

FOR BONDED FLASHINGS, refer to pages 22-23.

POURED CONCRETE AND POURED GYPSUM DECKS

STEEP ROOFS

SLAG SURFACE

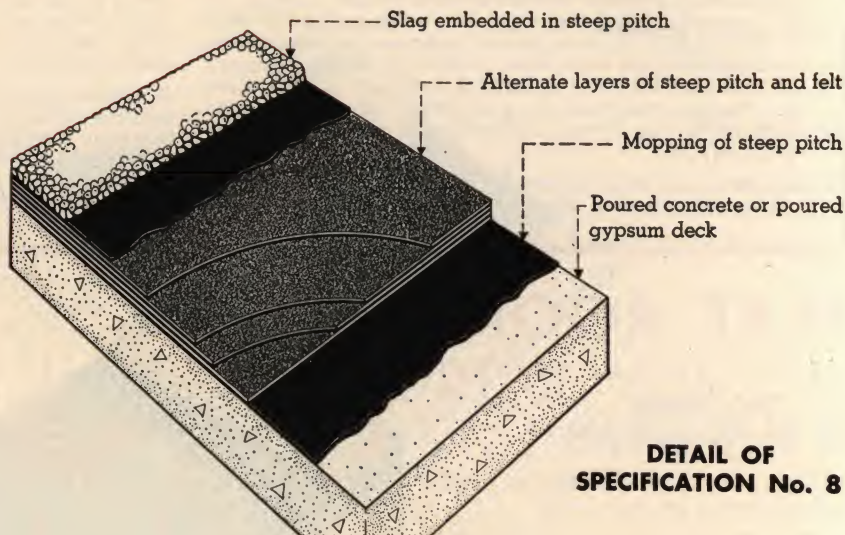
MAXIMUM INCLINE: 5 IN. PER FT.

MINIMUM INCLINE: 2 IN. PER FT.

POURED CONCRETE AND POURED GYPSUM DECKS

(Also for wood decks where Koppers Insulation Specification No. 201 is used.)

(If poured gypsum is not thoroughly dried, apply according to Specification No. 14 for 20 years, and Specification No. 26 for 15 years.)



**DETAIL OF
SPECIFICATION No. 8**

20 year—4 ply—Spec. No. 8

15 year—3 ply—Spec. No. 32

SPECIFICATIONS (Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

Do not apply built-up roofing to any surface which is not reasonably smooth and free from projections or holes which might cause puncture of roofing membrane. Surfaces must be dry. Immediately before the application of the roofing, thoroughly clean the surfaces of dust and loose material. Decks not permitting nailing shall have creosoted nailing strips set flush with the surface, these strips to be spaced three (3) feet apart up and down, not across slope of the roof.

Application of Roofing Materials

1st. (A) Over Poured Concrete: Mop deck completely with Koppers Steep Pitch.

(B) Over Poured Gypsum: Strip mop the deck with two (2) foot wide moppings of Koppers Steep Pitch with one (1) foot between moppings.

2nd. (Spec. No. 8—20 year)

Apply at right angles to the incline over the entire surface, four (4) plies of Koppers Approved Tarred Felt, lapping plies twenty-seven and one-half (27½) inches.

Mop solidly each ply of felt the full 27½ inch lap with Koppers Steep Pitch.

Nail each ply of felt with one (1) inch suitable nails through flat tin discs (or with staples for gypsum decks) nine and one-half (9½) inches from upper edge on twelve (12) inch centers. Where nailing strips are used, the felt shall be secured with two nails (at each nailing strip) spaced seven and one-half (7½) inches and nine and one-half (9½) inches respectively from the upper edge of each sheet. Pitch moppings between plies shall not extend beyond lower edge of overlying ply of felt so that finished felt surface is free of pitch. End strips shall not be applied over connecting plies of felt.

3rd. Pour or drip mop over the entire surface of the roofing membrane a uniform coating of approximately sixty (60) pounds of Koppers Steep Pitch in which, while hot, immediately embed firmly not less than two hundred seventy-five (275) pounds of clean, dry slag (from three-sixteenth (3/16) to one-half (½) inch in size) for each

one hundred (100) square feet. In cold weather slag shall be heated and dry before being applied. The finished slag surface shall be broomed lightly to remove loose slag.

General

At all two way ridges, for a distance of nine (9) inches on each side, pour a coating of steep pitch over slag and embed a second layer of slag.

Steep pitch shall not be heated above three hundred seventy-five (375) degrees F., nor applied to roof at less than three hundred twenty-five (325) degrees F.

Tarred felt should be laid without wrinkles or buckles.

At junction of steep and flat roofing, the roofing on the flat surface is to be carried up the inclined surface not less than twenty-four (24) inches before the steep roofing is applied. Application of steep roofing shall start at the point of junction with the flat roof.

Extend slag stops one and one-half (1½) inches above roof deck.

Materials Required per 100 Sq. Ft.

MATERIAL	Spec. No. 8 (20 year)	Spec. No. 32 (15 year)
Steep Pitch	160 lbs.	140 lbs.
Tarred Felt	60 lbs.	45 lbs.
Slag	275 lbs.	275 lbs.

BRIEF SPECIFICATION

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 8 for 20 years, No. 32 for 15 years) and requirements, and subject to Koppers inspection and approval. Upon completion of the work contractor to furnish Koppers Roofing Bond to the owner.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

FOR BONDED FLASHINGS, refer to pages 22-23.

POURED CONCRETE AND POURED GYPSUM DECKS (continued)

8a
6

STEEP ROOFS

MINERAL SURFACE

MAXIMUM INCLINE: 9 IN. PER FT.

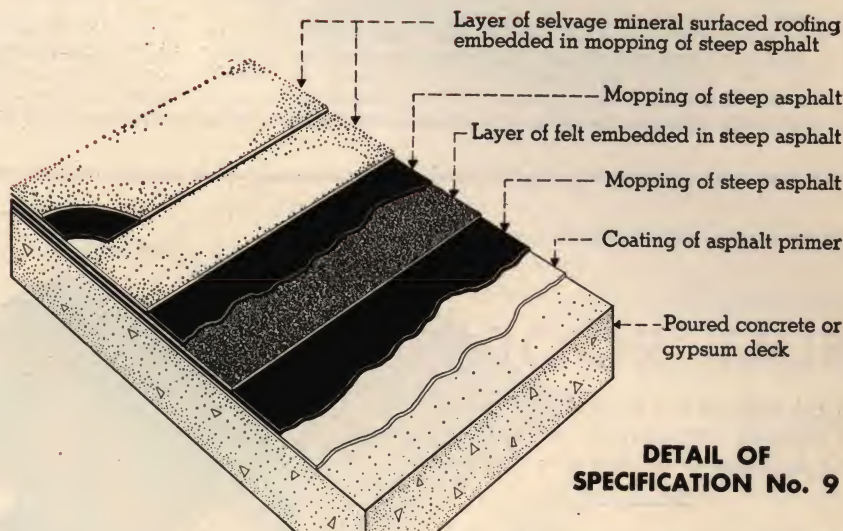
MINIMUM INCLINE: 3 IN. PER FT.

POURED CONCRETE AND POURED GYPSUM DECKS

(Also for wood decks where Koppers Insulation Specification No. 201 is used.)

15 year—Specification No. 33

10 year—Specification No. 9



DETAIL OF
SPECIFICATION No. 9

SPECIFICATIONS (Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

(Same as described under Specifications No. 8 and No. 32, page 8.)

Application of Roofing Materials

1st. Apply to the entire surface of the deck a priming coat of Asphalt Primer and allow to dry for a period of not less than six (6) hours.

2nd. (A) **Over Poured Concrete:** Mop deck completely with Koppers Steep Asphalt.

(B) **Over Poured Gypsum:** Strip mop the deck with two (2) foot wide moppings of steep asphalt with one (1) foot between moppings.

3rd. (Spec. No. 33—15 year)

Apply at right angles to the incline over the entire surface, two (2) plies of Koppers Approved Tarred Felt, lapping plies nineteen (19) inches.

Mop solidly each ply of felt the full 19 inch lap with Koppers Steep Asphalt.

Nail two (2) inches from upper edge on 18 inches o.c.

Each ply of felt shall be nailed with suitable nails through flat tin discs (or with staples for gypsum decks). Where nailing strips are used the felt shall be secured with three (3) one (1) inch barbed roofing nails through flat tin discs two (2), ten (10) and eighteen (18) inches from the upper edge respectively at each nailing strip.

4th. (Same as described in paragraph No. 2 in Specification No. 31 for 15 years, or Specification No. 4 for 10 years on page 6,

3rd. (Spec. No. 9—10 year)

Apply at right angles to the incline over the entire surface, one (1) ply of Koppers Approved Tarred Felt, lapping sheets six (6) inches.

Mop solidly each 6 inch lap with Koppers Steep Asphalt.

Nail two (2) inches from lower edge on 18 inches o.c.

except that if nailing strips are installed the following is to be inserted):

When nailing strips are installed, sheets shall be nailed along the selvage edge with three (3) nails driven through flat tin discs spaced five (5) inches apart at each nailing strip and kept back two (2) inches from mineral surfacing.

General

(Same as under "General" in Specifications No. 31 and No. 4, on page 6.)

Materials Required per 100 Sq. Ft.

MATERIAL	Spec. No. 33 (15 year)	Spec. No. 9 (10 year)
Asphalt Primer	1 gal.	1 gal.
Steep Asphalt	120 lbs.	90 lbs.
Tarred Felt	30 lbs.	15 lbs.
Selvage-edge Roofing	110 lbs.	110 lbs.

BRIEF SPECIFICATION

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 33 for 15 years, No. 9 for 10 years) and requirements, and subject to Koppers inspection and approval. Upon completion of the work, the contractor is to furnish Koppers Roofing Bond to the owner. NOTE: Koppers Company, Inc., will issue roofing bond when roofing is applied according to Specifications No. 33 and No. 9, only when applied in connection with Flat Bonded Koppers Roofing.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

FOR BONDED FLASHINGS, refer to pages 22-23.

KOPPERS

PRECAST CONCRETE SLAB DECKS

Precast concrete slab decks should receive the same careful scrutiny recommended for poured concrete or gypsum decks, although as a rule the possibility of moisture being present due to insufficient drying time is not likely to be encountered. However, the contractor will often find one or more slabs resting unevenly which results in edges projecting above the surface. This may have been due to poor workmanship in laying the slab and should be corrected by resetting or leveling off. Where it is necessary to fill low areas, the use of cinder aggregate is not recommended since this material traps air and moisture, causing it to expand and crack when

covered. The result is a badly blistered built-up roofing surface.

Because the steel work supporting concrete slabs will expand and contract, the resultant movement of the slabs will cause cracks in the roof membrane unless "spot mopping" is employed. This provides for the keeping back of pitch moppings for a certain distance from the cracks, thereby permitting the roofing felts some freedom of movement over the joints. Spot moppings also insure against the possibility of the pitch seeping through the joints into the interior of the building.

FLAT ROOFS

GRAVEL OR SLAG SURFACE
MAXIMUM INCLINE: 2 IN. PER FT.
PRECAST CONCRETE SLAB

20 year—4 ply—Spec. No. 10

15 year—3 ply—Spec. No. 11

SPECIFICATIONS

(Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

Do not apply built-up roofing to any surface which is not reasonably smooth and free from projections or holes which might cause puncture of the membrane. Surfaces must be dry. Immediately before the application of the roofing, thoroughly clean the surface of dust and loose material. Decks of inclines exceeding one (1) inch and less than two (2) inches to the foot shall permit nailing, or nailing strips must be set in the deck flush with the surface, these strips to be spaced three (3) feet apart and placed up and down and not across the slope of the roof. All joints between precast concrete slabs shall be pointed up with plastic cement which shall be troweled so that the top surface is level with the deck.

Application of Roofing Materials

1st. Each slab shall be spot or strip mopped with Koppers Old Style Pitch, keeping pitch moppings back at least four (4) inches from edge of each slab joint.

2nd. (Spec. No. 10—20 year)

Apply over the entire surface four (4) plies of Koppers Approved Tarred Felt, lapping plies twenty-seven and one-half (27½) inches.

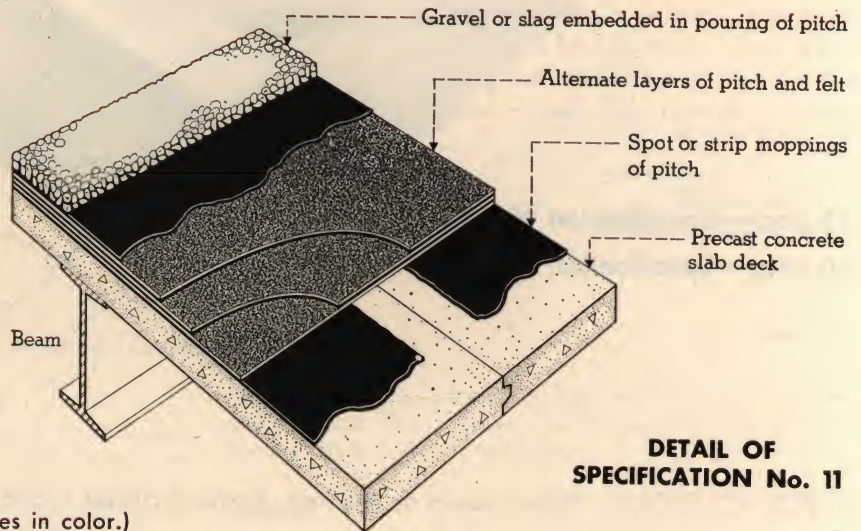
Mop solidly between each 27½ inch lap with Koppers Old Style Pitch so that in no place shall felt touch felt.

Where slope of deck is more than one (1) inch but less than two (2) inches per foot and deck permits nailing, nail along the upper edge of sheet, nails to be spaced twenty-four (24) inches o.c. Where nailing strips are installed, nail each ply of felt with one (1) inch barbed roofing nails through flat tin discs three (3) inches from upper edge on three (3) foot centers.

2nd. (Spec. No. 11—15 year)

Apply over the entire surface three (3) plies of Koppers Approved Tarred Felt lapping plies twenty-four and two-third (24⅔) inches.

Mop solidly between the 24⅔ inch lap with Koppers Old Style Pitch so that in no place shall felt touch felt.



DETAIL OF
SPECIFICATION No. 11

3rd. Pour over the entire surface of the roofing membrane a uniform coating of approximately seventy-five (75) pounds of Koppers Old Style Pitch, into which, while hot, embed not less than four hundred (400) pounds of one-quarter (¼) to five-eighth (⅝) inch clean dry gravel or three hundred (300) pounds of slag for each one hundred (100) square feet.

General

Pitch shall not be heated above three hundred seventy-five (375) degrees F. Tarred felt shall be laid without wrinkles or buckles.

Gravel or slag shall be applied within eight (8) days after application of felts. During freezing weather, all exposed felts shall be either immediately graveled or slagged in, or, if this is impossible, exposed felt surfaces shall be glazed with a mopping of pitch.

Materials Required per 100 Sq. Ft.

MATERIAL	Spec. No. 10 (20 year)	Spec. No. 11 (15 year)
Pitch	200 lbs.	175 lbs.
Felt	60 lbs.	45 lbs.
Gravel	400 lbs.	400 lbs.
OR		
Slag	300 lbs.	300 lbs.

BRIEF SPECIFICATIONS

The roofing is to be applied by roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 10 for 20 years, No. 11 for 15 years) and requirements, and subject to Koppers inspection and approval. Upon completion of the work, contractor is to furnish Koppers Roofing Bond to the owner.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

FOR BONDED FLASHINGS, refer to pages 22-23.

PRECAST GYPSUM OR GYPSUM STEEL PLANK DECKS

The same recommendations applying to precast concrete slabs apply to precast gypsum slabs and gypsum steel planks. All uneven slabs should be reset or leveled off so that the roof will be laid on a flat and even surface, free from

projections and low areas.

Because these slabs are precast, the possibility of a high moisture content being present is more remote than in the poured gypsum deck and the precautions are not therefore necessary.

FLAT ROOFS

GRAVEL OR SLAG SURFACE
MAXIMUM INCLINE: 2 IN. PER FT.
PRECAST GYPSUM—GYPSUM STEEL
PLANK DECKS (on Poured Gypsum, refer to Specifications No. 5 or No. 7.)

20 year—5 ply—Spec. No. 12

15 year—4 ply—Spec. No. 13

SPECIFICATIONS

(Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

Do not apply built-up roofing to any surface which is not reasonably smooth and free from projections or holes which might cause puncture of the membrane. Surfaces must be dry. Immediately before the application of the roofing, thoroughly clean the surface of dust and loose material. Decks of inclines exceeding one (1) inch and less than two (2) inches to the foot shall permit nailing, or nailing strips must be set in the deck flush with the surface, these strips to be spaced three (3) feet apart and placed up and down and not across the slope of the roof. All joints between precast concrete slabs shall be pointed up with plastic cement which shall be troweled so that the top surface is level with the deck.

Application of Roofing Materials

1st. Apply over the entire surface two (2) dry plies of Koppers Approved Tarred Felt. Lap plies nineteen (19) inches. Nail as required to hold in place.

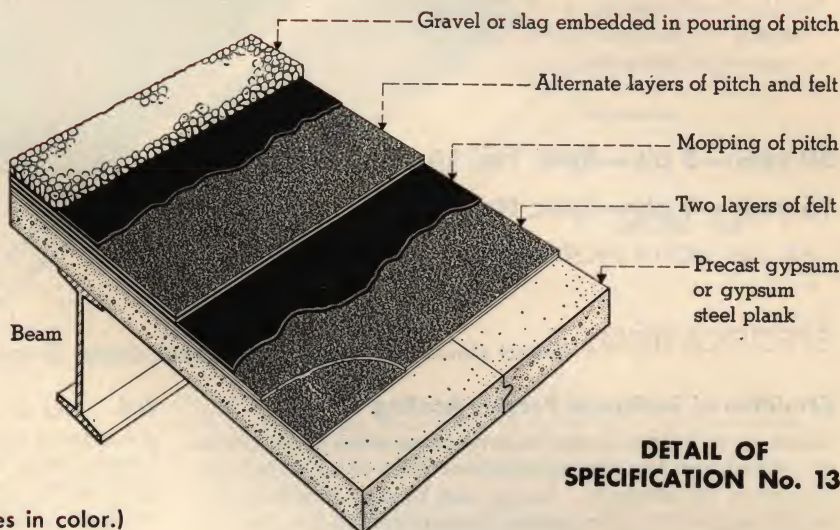
2nd. Mop with Koppers Old Style Pitch the entire surface preceding the application of additional plies of felt.

3rd. (Spec. No. 12—20 year)

Apply three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-third (24 $\frac{2}{3}$) inches. Nail each sheet of felt with one and one-half (1 $\frac{1}{2}$) inch barbed roofing nails through flat tin discs or with staples, six (6) inches from the upper edge on twenty-four (24) inch centers. All laps shall be mopped with pitch the full 24 $\frac{2}{3}$ inches, so that in no place shall felt touch felt.

3rd. (Spec. No. 13—15 year)

Apply two (2) plies of Koppers Approved Tarred Felt, lapping plies nineteen (19) inches. Nail each sheet with one and one-half (1 $\frac{1}{2}$) inch barbed roofing nails through flat tin discs or with staples, six (6) inches from the upper edge on twenty-four (24) inch centers. All laps shall be mopped with pitch the full nineteen (19) inches so that in no place shall felt touch felt.



DETAIL OF SPECIFICATION No. 13

4th. Pour over the entire surface of the roofing membrane a uniform coating of approximately seventy-five (75) pounds of Koppers Old Style Pitch, into which, while hot, embed not less than four hundred (400) pounds of one-quarter ($\frac{1}{4}$) to five-eighth ($\frac{5}{8}$) inch clean dry gravel or three hundred (300) pounds of slag for each one hundred (100) sq. ft.

General

Pitch shall not be heated above three hundred and seventy-five (375) degrees F. Tarred Felt shall be laid without wrinkles or buckles.

Gravel or slag shall be applied within eight (8) days after application of felts. During freezing weather, all exposed felts shall be either immediately graveled or slagged in, or, if this is impossible, exposed felt surfaces shall be glazed with a mopping of pitch.

Materials Required per 100 Sq. Ft.

MATERIAL	Spec. No. 12 (20 year)	Spec. No. 13 (15 year)
Pitch	150 lbs.	125 lbs.
Tarred Felt	75 lbs.	60 lbs.
Gravel	400 lbs.	400 lbs.
OR	OR	OR
Slag	300 lbs.	300 lbs.

BRIEF SPECIFICATION

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 12 for 20 years, No. 13 for 15 years) and requirements, and subject to Koppers inspection and approval. Upon completion of the work, the contractor is to furnish Koppers Roofing Bond to the owner.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

FOR BONDED FLASHINGS, refer to pages 22-23.

PRECAST GYPSUM, GYPSUM STEEL PLANK OR CONCRETE SLABS

STEEP ROOFS

SLAG SURFACE

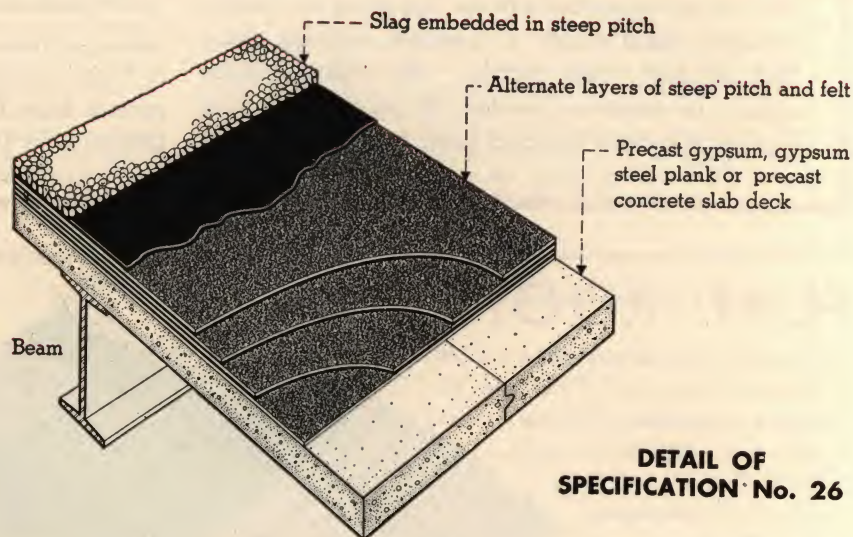
MAXIMUM INCLINE: 5 IN. PER FT.

MINIMUM INCLINE: 2 IN. PER FT.

PRECAST GYPSUM—GYPSUM STEEL
PLANK OR CONCRETE SLAB DECKS

20 year—5 ply—Spec. No. 14

15 year—4 ply—Spec. No. 26



DETAIL OF
SPECIFICATION No. 26

SPECIFICATIONS (Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

Do not apply built-up roofing to any surface which is not reasonably smooth and free from projections or holes which might cause puncture of the membrane. Surface must be dry. Immediately before the application of the roofing, thoroughly clean the surface of dust and loose material. Concrete slabs not permitting nailing shall have creosoted nailing strips set flush with the surface, spaced three (3) feet apart and set parallel to the incline of the roof.

All joints between precast concrete slabs shall be pointed up with plastic cement which shall be troweled so that the top surface is level with the deck.

Application of Roofing Materials

1st. Each slab shall be spot or strip mopped with Koppers Steep Pitch; keeping pitch moppings back at least four (4) inches from edge of each slab joint.

2nd. (Spec. No. 14—20 year)

Apply at right angles to the incline over the entire surface, five (5) plies of Koppers Approved Tarred Felt, lapping each sheet twenty-nine (29) inches. Nail each ply with one and one-half (1½) inch cut nails through flat tin discs eight (8) inches from the upper edge on twelve (12) inch centers.

Mop back each lap for a distance of twenty-seven (27) inches with Koppers Steep Pitch.

When nailing strips are used each ply of felt shall be secured with two (2) one (1) inch barbed roofing nails through flat tin discs at each nailing strip, placed seven and one-half (7½) and nine and one-half (9½) inches respectively from the upper edge of each sheet.

Pitch moppings between plies shall not extend beyond the lower edge of the overlying ply of felt, so that the finish felt surface is free of pitch. End strips shall not be applied over connecting plies of felt.

2nd. (Spec. No. 26—15 year)

Apply at right angles to the incline over the entire surface four (4) plies of Koppers Approved Tarred Felt, lapping each sheet twenty-seven and one-half (27½) inches. Nail each ply with one and one-half (1½) inch cut nails through flat tin discs nine and one-half (9½) inches from upper edge on twelve (12) inch centers.

Mop back each lap for a distance of twenty-five and one-half (25½) inches with Koppers Steep Pitch.

3rd. Pour or drip mop over the entire surface of the roofing membrane a uniform coating of approximately sixty (60) pounds of Koppers Steep Pitch, into which, while hot, immediately embed firmly not less than two hundred and seventy-five (275) pounds of clean, dry slag (three-sixteenth (3/16) to one-half (½) inch in size) for each one hundred (100) sq. ft.

In cold weather, slag shall be heated and dry before being applied. The finished slag surface shall be broomed lightly to remove slag.

General

At all ridges, for a distance of nine (9) inches on each side, pour a coating of steep pitch over slag and embed a second layer of slag.

Steep Pitch shall not be heated above three hundred seventy-five (375) degrees F., nor applied to roof at less than three hundred and twenty-five (325) degrees F.

Tarred Felt shall be laid without wrinkles or buckles.

At junction of steep and flat roofing, the roofing on the flat surfaces is to be carried up the inclined surface not less than twenty-four (24) inches before steep roofing is applied. Application of steep roofing shall start at the point of junction with the flat roof.

Extend slag stops one and one-half (1½) inches above roof deck.

Materials Required per 100 Sq. Ft.

MATERIAL	Spec. No. 14 (20 year)	Spec. No. 26 (15 year)
Tarred Felt	75 lbs.	60 lbs.
Steep Pitch	140 lbs.	120 lbs.
Slag	275 lbs.	275 lbs.

BRIEF SPECIFICATION

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 14 for 20 years, No. 26 for 15 years) and requirements, and subject to Koppers inspection and approval. Upon completion of the work, the contractor is to furnish Koppers Roofing Bond to the owner.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

FOR BONDED FLASHINGS, refer to pages 22-23.

PRECAST GYPSUM, GYPSUM STEEL PLANK OR CONCRETE SLABS

8a
6

STEEP ROOFS

MINERAL SURFACE

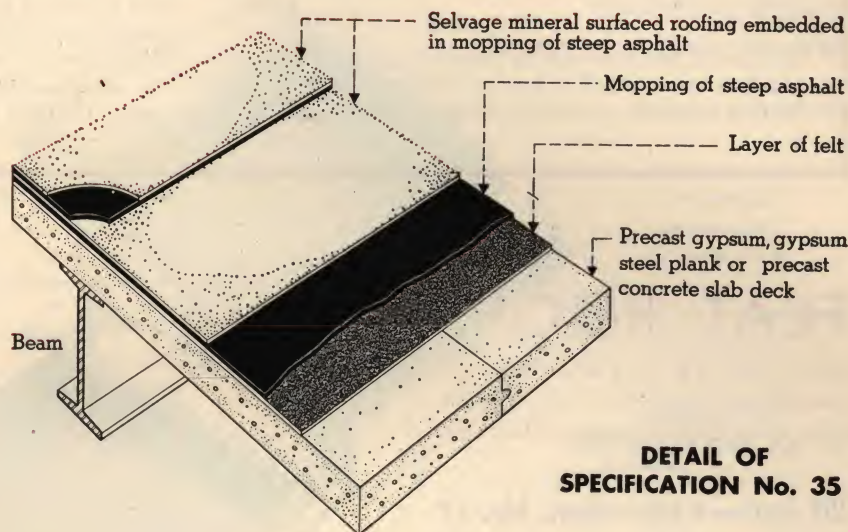
MAXIMUM INCLINE: 9 IN. PER FT.

MINIMUM INCLINE: 3 IN. PER FT.

PRECAST GYPSUM—GYPSUM STEEL
PLANK OR PRECAST CONCRETE SLAB DECKS

15 year—Specification No. 34

10 year—Specification No. 35



DETAIL OF
SPECIFICATION No. 35

SPECIFICATIONS (Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

Do not apply built-up roofing to any surface which is not reasonably smooth and free from projections or holes which might cause puncture of the membrane. Surface must be dry. Immediately before the application of the roofing, thoroughly clean the surface of dust and loose material. Concrete slabs not permitting nailing shall have creosoted nailing strips set flush with the surface, spaced three (3) feet apart and set parallel to the incline of the roof. All joints between precast concrete slabs shall be pointed up with plastic cement which shall be troweled so that the top surface is level with the deck.

Application of Roofing Materials

1st. (Spec. No. 34—15 year)

Apply at right angles to the incline over the entire surface, two (2) plies of Koppers Approved Tarred Felt, lapping plies nineteen (19) inches. Nail each ply of felt two (2) inches from upper edge eighteen (18) inches o.c., with one and one-half (1½) inch barbed roofing nails through flat tin discs (or with staples for gypsum decks).

Mop back each ply of felt for a distance of seventeen (17) inches with Koppers Steep Asphalt.

When nailing strips are used, the felt shall be secured with three (3) one (1) inch barbed roofing nails through flat tin discs, two (2) inches, ten (10) inches, and eighteen (18) inches respectively from the upper edge at each nailing strip.

2nd. Beginning at the low point, thoroughly mop a portion of the tarred felt surface with Koppers Steep Asphalt, into which, while hot, embed a sheet of selvage edge mineral surface roofing, this to run across the slope of the roof. Selvage should be on upper edge. Nail in double staggered course along selvage with one (1) inch barbed roofing nails through flat tin discs, kept two (2) inches from the mineral surfacing and twelve (12) inches o.c. for each course. Mop the selvage of the sheet just laid and the adjacent area of tarred felt surface with Steep Asphalt and into this, while hot, embed thoroughly the next sheet of mineral surfaced roofing, taking care that the lower edge meets the edge of the mineral surfacing of the sheet below. Nail as described for previous sheet. Repeat the process of laying sheets of mineral surfaced roofing shingle fashion until the entire area has been covered. Lap ends six (6) inches, nailing the underlying sheet with six (6) one (1) inch

1st. (Spec. No. 35—10 year)

Apply at right angles to the incline over the entire surface, one (1) ply of Koppers No. 30 Tarred Felt, lapping ply four (4) inches. Nail each ply along lapped edge on eighteen (18) inch centers with one and one-half (1½) inch barbed roofing nails through flat tin discs (or with staples for gypsum decks).

barbed roofing nails through flat tin discs, starting one (1) inch from the lower edge, spaced five (5) inches o.c. Coat the underside of mineral surfaced roofing on each end lap with Steep Asphalt and firmly embed in the surface of the underlying sheet. Carefully rub down edges.

When nailing strips are installed, sheets shall be nailed along the selvage edge with three (3) inch nails driven through flat tin discs, spaced five (5) inches apart, at each nailing strip and set back two (2) inches from the mineral surface.

General

Mineral surfaced roofing is to be cut in strips not exceeding twenty (20) feet in length, prior to using, and is to be stacked flat for a sufficient time to permit these strips to become perfectly flat.

Tarred Felt and Mineral Surfaced Roofing should be laid without wrinkles or buckles.

Steep Asphalt shall not be heated above four hundred (400) degrees F.

At junction of steep and flat roofing, the roofing on the flat surface is to be carried up the inclined surface not less than twenty-four (24) inches before steep roofing is applied. Application of steep roofing shall start at the point of junction with the flat roof.

Materials Required per 100 Sq. Ft.

MATERIAL	Spec. No. 34 (15 year)	Spec. No. 35 (10 year)
Felt	30 lbs.	30 lbs.
Asphalt	90 lbs.	60 lbs.
Mineral Surfaced Roofing	110 lbs.	110 lbs.

BRIEF SPECIFICATION

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 34 for 15 years, No. 35 for 10 years) and requirements, and subject to Koppers inspection and approval. Upon completion of the work, the contractor is to furnish Koppers Roofing Bond to the owner.

NOTE: Koppers Company, Inc., will issue roofing bonds where roofing is applied according to Specifications No. 34 and No. 35 only when applied in connection with flat bonded Koppers Roofing.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

FOR BONDED FLASHINGS, refer to pages 22-23.

STEEL DECK WITH INSULATION

It is absolutely necessary to insulate steel decks in order to obtain a roofing bond.

Because condensation quickly forms on all metals, steel decks should be covered with at least one thickness of rigid board insulation to protect the built-up roofing against the harmful ef-

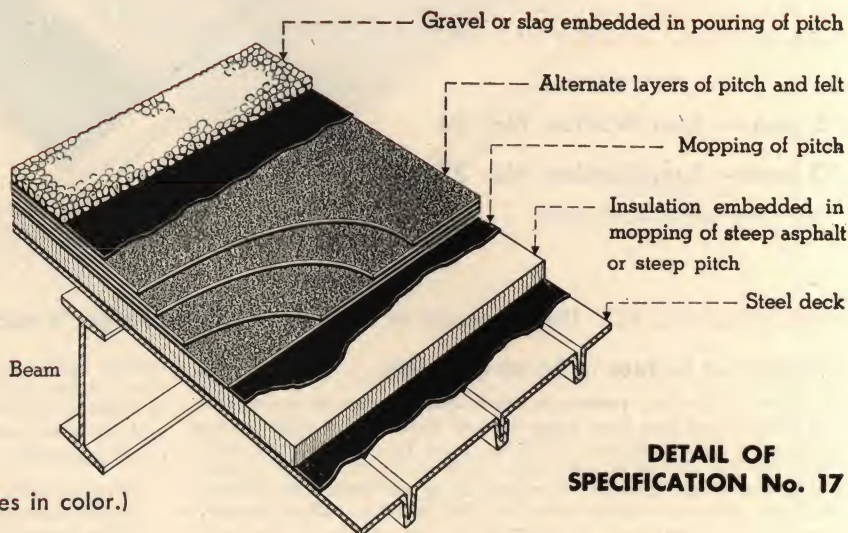
fects of moisture. The insulation should be applied only when it is absolutely dry; applying or laying damp insulation will undoubtedly result in serious trouble. A steel deck should be cleaned smooth and properly anchored to the steel purlins and all joints correctly lapped. A shop coat applied before the steel is delivered to the job is recommended.

FLAT ROOFS

GRAVEL OR SLAG SURFACE
MAXIMUM INCLINE: 1 IN. PER FT.
STEEL DECK WITH INSULATION

20 year—4 ply—Spec. No. 17

15 year—3 ply—Spec. No. 18



DETAIL OF
SPECIFICATION No. 17

SPECIFICATIONS

(Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

Steel roof decks shall be dry, clean and free from rust or oily substances. Immediately before the application of the insulation, thoroughly clean the surface of rust and loose material.

Application of Insulation and Roofing Materials

1st. Apply over the entire surface a mopping of Steep Asphalt or Steep Pitch, into which, while hot, embed the insulation, pressing firmly into the asphalt or pitch. The insulation must be thoroughly dry and of approved type and must be able to retain nails. When more than one (1) layer of insulation is used the top surface of each layer shall be coated with Old Style Pitch into which, while hot, embed the succeeding layer. (This is optional because layers may be laid dry if desired.) All joints shall be broken between the layers of insulation. All layers of insulation shall be parallel to preceding layers. Edges shall be brought closely together and shall not be forced into place. No more insulation shall be installed at any one time than can be protected by pitch and felt in case of sudden weather changes. Cut-offs consisting of two (2) plies of Tarred Felt and moppings of Steep Asphalt or Steep Pitch extending on to the deck at least six (6) inches and four (4) inches on top of the insulation shall be applied at the end of each day's work over exposed edges of insulation.

All edges of insulation adjoining parapet walls, cant, eaves, vertical surfaces, etc., shall be sealed by applying two (2) plies of Tarred Felt and moppings of Asphalt.

2nd. Mop a uniform coating of Koppers Old Style Pitch over the insulation preceding the application of roofing membrane.

3rd. (Spec. No. 17—20 year)

Apply over the entire surface, four (4) plies of Koppers Approved Tarred Felt, lapping plies twenty-seven and one-half (27½) inches.

Mop solidly between each 27½ inch lap with Koppers Old Style Pitch so that in no place shall felt touch felt.

4th. Pour over the entire surface of the roofing membrane a uniform coating of approximately seventy-five (75) pounds of Koppers Old Style Pitch into which, while hot, embed not less than four

3rd. (Spec. No. 18—15 year)

Apply over the entire surface, three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-third (24⅔) inches.

Mop solidly between each 24⅔ inch lap with Koppers Old Style Pitch so that in no place shall felt touch felt.

hundred (400) pounds of one-quarter (¼) to five-eighth (⅝) inch clean dry gravel or three hundred (300) pounds of slag for each one hundred (100) sq. ft.

General

Pitch shall not be heated above three hundred seventy-five (375) degrees F. Tarred Felt shall be laid without wrinkles or buckles.

Gravel or slag shall be applied within eight (8) days after application of felts. During freezing weather, all exposed felts shall be either immediately graveled or slagged in, or, if this is impossible, exposed felt surfaces shall be glazed with a mopping of pitch.

Material Required per 100 Sq. Ft.

MATERIAL	Spec. No. 17 (20 year)	Spec. No. 18 (15 year)
Asphalt	25 lbs.	25 lbs.
Felt	60 lbs.	45 lbs.
Pitch	(*) 200 lbs.	(*) 175 lbs.
Slag	300 lbs.	300 lbs.
OR	OR	OR
Gravel	400 lbs.	400 lbs.

(*) When more than one layer of insulation is installed and pitch is mopped between layers, add 35 pounds per square for each mopping.

BRIEF SPECIFICATION

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 17 for 20 years, No. 18 for 15 years) and requirements and subject to Koppers inspection and approval. Upon completion of the work, the contractor is to furnish Koppers Roofing Bond to the owner.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

Koppers Company, Inc., will not be responsible for any damage to or below built-up roofing caused by or as the result of the use of insulation.

FOR BONDED FLASHINGS, refer to pages 22-23.

STEEP ROOFS

SLAG SURFACE

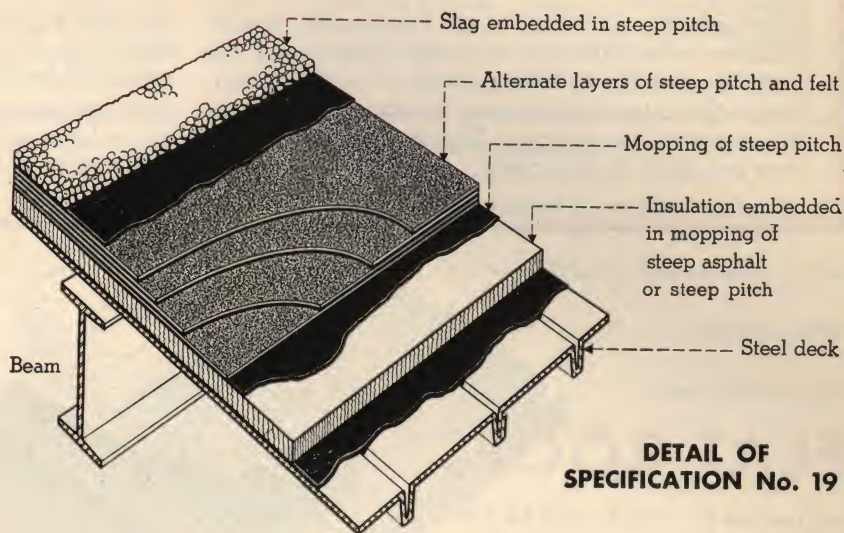
MAXIMUM INCLINE: 5 IN. PER FT.

MINIMUM INCLINE: 1 IN. PER FT.

STEEL DECK WITH INSULATION

20 year—4 ply—Spec. No. 19

15 year—3 ply—Spec. No. 36



DETAIL OF
SPECIFICATION No. 19

SPECIFICATIONS (Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

(Same as described in Specification No. 17 and No. 18, page 14.)

Application of Insulation and Roofing Materials

1st. Apply over the entire surface a mopping of Steep Asphalt or Steep Pitch, into which, while hot, embed the insulation, pressing firmly into the asphalt or pitch. The insulation must be thoroughly dry and of an approved type and must be able to retain nails. Insulation shall be securely fastened to the deck by means of approved screws, expanding nails or cleats which shall be placed at each corner and at the center of each sheet of insulation. When more than one (1) layer of insulation is applied, fasteners shall be driven after the top layer has been applied. The top surface of each layer of insulation shall be coated with Steep Pitch into which embed the succeeding layers. (This is optional, because insulation sheets may be laid dry if desired.) All joints shall be broken between layers of insulation. All layers of insulation shall be parallel to succeeding layers. Edges shall be brought closely together and shall not be forced into place.

No more insulation shall be installed at any one time than can be protected by pitch and felt in case of sudden weather changes.

Cut offs consisting of two (2) plies of tarred felt and moppings of steep asphalt or steep pitch extending on to the deck at least six (6) inches and four (4) inches on top of the insulation, shall be applied at the end of each day's work over exposed edges of insulation.

All edges of insulation adjoining parapet walls, cants, eaves, vertical surfaces, etc., shall be sealed by applying two (2) plies of tarred felt and moppings of asphalt or pitch.

2nd. Mop a uniform coating of Koppers Steep Pitch over the insulation preceding the application of roofing membrane.

3rd. (Spec. No. 19—20 year)

Apply at right angles to the incline over the entire surface four (4) plies of Koppers Approved Tarred Felt, lapping plies twenty-seven and one-half (27½) inches.

Mop solidly each ply of felt the full 27½ inch lap with Koppers Steep Pitch.

3rd. (Spec. No. 36—15 year)

Apply at right angles to the incline over the entire surface three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-third (24⅔) inches.

Mop solidly each ply of felt the full 24⅔ inch lap with Koppers Steep Pitch.

Nail each ply of felt with nails of sufficient length to completely penetrate the insulation, but not long enough to puncture the steel deck. Nails to be through flat tin discs nine and one-half (9½) inches from upper edge and on twelve (12) inch centers.

Pitch moppings between plies shall not extend beyond lower edge of overlying ply of felt, so that the finished felt surface is free of pitch.

4th. Pour or drip mop over the entire surface of the roofing membrane a uniform coating of approximately 60 pounds of Koppers Steep Pitch into which, while hot, immediately embed firmly not less than two hundred seventy-five (275) pounds of clean, dry slag (from three-sixteenth (⅜) to one-half (½) inch for each 100 sq. ft.). In cold weather, slag shall be heated before being applied. The finished slag surface shall be broomed lightly to remove loose slag.

General

At all two way ridges, for a distance of nine (9) inches on each side, pour a coating of steep pitch over slag and embed a second layer of slag.

Steep Pitch shall not be heated above three hundred seventy-five (375) degrees F., nor applied to roof at less than three hundred twenty-five (325) degrees F. Tarred felt shall be laid without wrinkles or buckles.

At junction of steep and flat roofing the roofing on the flat surface is to be carried up the inclined surface not less than twenty-four (24) inches before the steep roofing is applied. Application of steep roofing shall start at the point of junction with the flat roof.

Extend slag stops one and one-half (1½) inches above roof deck.

Material Required per 100 Sq. Ft.

MATERIAL	Spec. No. 19 (20 year)	Spec. No. 36 (15 year)
Asphalt	30 lbs.	30 lbs.
Tarred Felt	60 lbs.	45 lbs.
Steep Pitch	160 lbs.	140 lbs.
Slag	275 lbs.	275 lbs.

BRIEF SPECIFICATION

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 19 for 20 years, No. 36 for 15 years) and requirements, and subject to Koppers inspection and approval. Upon completion of the work the contractor is to furnish Koppers Roofing Bond to the owner.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

FOR BONDED FLASHINGS, refer to pages 22-23.

PROMENADE TILE SURFACING

Although it is practical to set promenade tiles in bitumen or mastic, it is not recommended if tile is to be exposed to long periods of sunlight since heat will cause the material to come up through the joints to the surface. This is not only expensive but difficult to remedy.

In order to insure against damage due to expansion and contraction, expansion joints should be provided for all surfaces exceeding 400 square feet.

After tile has been laid all traffic should be barred for at least 24 hours, after which the tile should be thoroughly scoured and flushed with water.

FLAT ROOFS

PROMENADE TILE SURFACING
MAXIMUM INCLINE: 1 IN. PER FT.
POURED CONCRETE DECKS

20 year—5 ply—Spec. No. 20

SPECIFICATIONS

Condition of Surface to Receive Roofing

Do not apply built-up roofing to any surface which is not smooth and free from projections and holes which might cause puncture of the membrane. Surfaces must be dry. Immediately before the application of the roofing, thoroughly clean the surface of dust and loose material.

Application of Roofing Material

1st. Mop deck completely with Koppers Old Style Pitch.

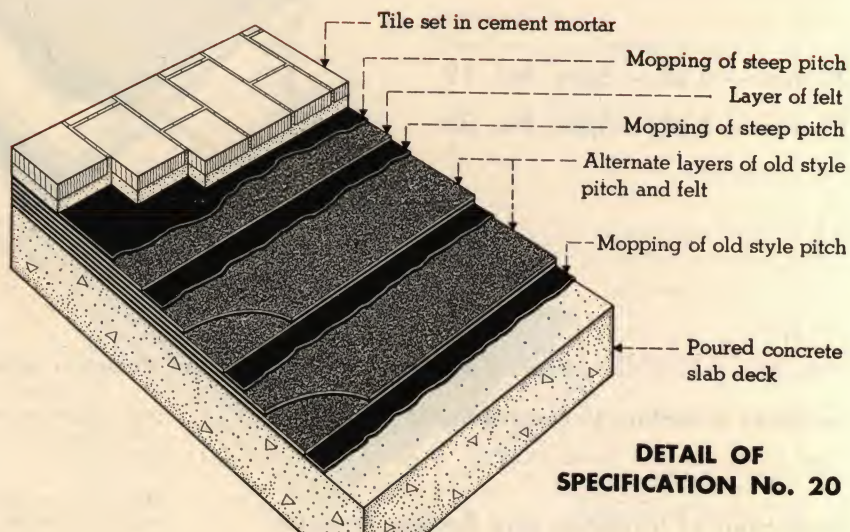
2nd. Apply over the entire surface two (2) plies of Koppers Approved Tarred Felt, lapping each ply nineteen (19) inches. Mop Koppers Old Style Pitch solidly between each 19 inch lap so that in no place shall felt touch felt.

3rd. Mop the entire surface of the first two plies of felt preceding the application of additional plies with Koppers Old Style Pitch.

4th. Apply over the entire surface two (2) plies of Koppers Approved Tarred Felt, lapping plies nineteen (19) inches. Mop Old Style Pitch solidly between each 19 inch lap so that in no place shall felt touch felt.

5th. Before laying the tile, the surface of the roofing shall be thoroughly cleaned and the roofing mopped with Steep Roof Pitch into which, while hot, embed one (1) layer of tarred felt, lapping each sheet two (2) inches over the preceding sheet. Over this surfacing and immediately preceding the laying of the tile, spread a heavy uniform coating of Steep Roofing Pitch. Only part of the roof surface shall be covered with the last ply of felt and mopping of pitch at one time, the tile then being laid over that portion at once.

6th. The vitrified clay tile shall be set in not less than three-quarter (¾) inches of Portland Cement Mortar (1 to 3 mix). The joints shall be grouted full with Portland Cement Mortar (1 to 2 mix). The tile shall be laid to show three-sixteenths (⅜) inch to one-fourth (¼) inch joints. Expansion joints three-quarters (¾) inch wide filled with plastic mixture, which must be approved by the architect, shall be provided between the tile and all flashings. Either metal or mastic expansion joints shall be provided throughout the roof surface as may be necessary. Expansion joints shall extend through to the roofing and shall be spaced not more than twenty (20) feet apart in any direction. They shall also be installed at all walls, skylights, curbs, etc.



DETAIL OF
SPECIFICATION No. 20

General

Pitch shall not be heated above three hundred and seventy-five (375) degrees F.

Felt shall be laid without wrinkles or buckles.

All end laps shall be staggered at least six (6) inches.

Tile shall be applied within eight (8) days after application of felts. During freezing weather, exposed felt surfaces shall be glazed with a mopping of pitch.

Material Required per 100 Sq. Ft.

MATERIAL	Spec. No. 20 (20 year)
Old Style Pitch	125 lbs.
Steep Pitch	75 lbs.
Felt	75 lbs.

BRIEF SPECIFICATION

The roofing is to be applied by roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specification No. 20, and requirements, and subject to Koppers inspection and approval. Upon completion of the work, the contractor is to furnish Koppers Roofing Bond to the owner.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

Notice: Koppers Company, Inc., will not be responsible or liable for leaks due to the installation, contraction or expansion of Promenade Tile and will not be responsible for the taking up and replacing of tile in order to locate leaks through the roofing.

FOR BONDED FLASHINGS, refer to pages 22-23.

TARMAC CONCRETE WEARING SURFACE

Where it is desirable to utilize a roof deck for a parking area or similar purpose, Koppers Tarmac Concrete Wearing Surface should be installed. This provides a tough, durable mixture which is resilient, dustless, and unaffected by water or gasoline

and oil drippings. It provides a sanitary and lasting surface. The roof deck should be of sufficient strength to permit compaction of the Tarmac Concrete with a power roller.

FLAT ROOFS

TARMAC WEARING TOP
MAXIMUM INCLINE: 1/2 IN. PER FT.
POURED CONCRETE DECKS

Specification No.
27 — 4 ply

SPECIFICATIONS

Condition of Surface to Receive Roofing

Do not apply built-up roofing to concrete surfaces which are not reasonably smooth and free from projections and holes which might puncture the membrane. All outlets shall be installed to sufficient height above the roof deck to permit placing around the outlets, the specified depth of Tarmac Concrete Wearing Surface over the membrane roofing. The outlets shall be suitably flanged and screened. When the roof deck is dry and immediately before the application of the membrane roofing, thoroughly clean all dust and loose material from the surface.

Application of Built-Up Roofing

1st. Mop deck completely with Koppers Old Style Pitch.

2nd. Apply over the entire surface four plies of Koppers Approved Tarred Felt, lapping plies twenty-seven and one-half (27 1/2) inches. Mop solidly between each 27 1/2 inch lap with Koppers Old Style Pitch so that in no place shall felt touch felt.

3rd. Pour over the entire surface of the roofing membrane a uniform coating of approximately eighty-five (85) pounds of Koppers Old Style Pitch, into which, while hot, embed not less than three hundred (300) pounds of clean dry one-quarter (1/4) inch to five-eighths (5/8) inch gravel for each 100 sq. ft.

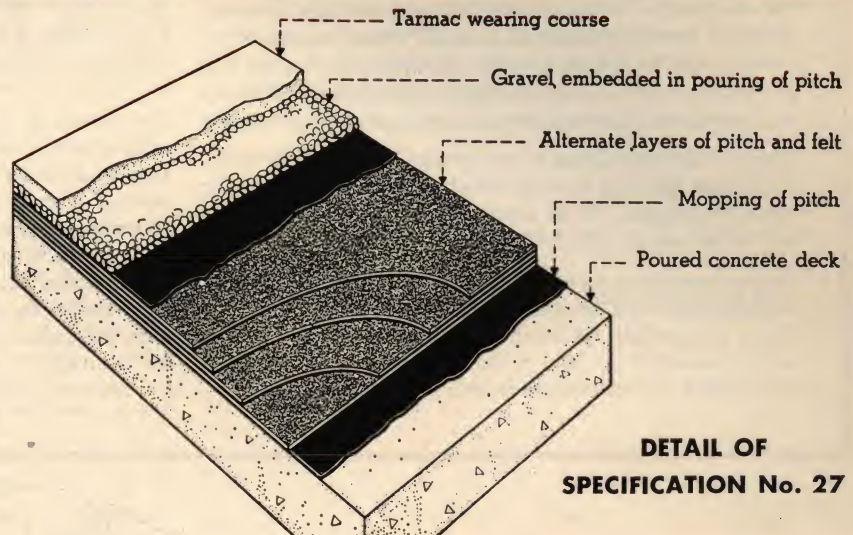
The gravel cover shall be spread directly from wheel barrows or from stock piles dumped on metal sheets or tarpaulins placed over the roofing membrane. No excess areas or ridges of pitch around the edges of the stock piles will be permitted.

Application of Tarmac Concrete Wearing Surface

1st. After the roofing gravel has been applied, sweep up and remove all excess loose gravel. Over this surface, apply the Tarmac Concrete Wearing Surface in two courses. The bottom or binder course, shall consist of a coarse mix spread to a compacted depth of 1 1/2 inch, over which shall be placed the top coarse compacted to a depth of 1 inch.

2nd. **Composition of Mixtures:** The mixtures shall have the following composition:

	Binder Course Stone and Gravel; Slag		Top Course Stone and Gravel; Slag	
Tar Cement (Tarmac T-10, 11 or 12), percent by weight	3.5- 5.5	4.5- 7.5	6.5- 8.5	8.0-11.0
Mineral Aggregate percent by weight	94.5-96.5	92.5-95.5	91.5-93.5	89.0-92.0



DETAIL OF
SPECIFICATION No. 27

3rd. **Grading of Aggregate:** The mixtures, when tested by standard laboratory sieves with square openings, shall meet the following requirements:

	Binder Course	Top Course
Passing 1 1/2 inch sieve	100	..
Passing 1 inch sieve, percent	75-100	..
Passing 1/2 inch sieve, percent	45-75	100
Passing 3/8 inch sieve, percent	..	85-100
Passing No. 4 sieve, percent	20-45	55-85
Passing No. 10 sieve, percent	10-30	35-65
Passing No. 40 sieve, percent	0-10	15-35
Passing No. 80 sieve, percent	0-5	7-20
Passing No. 200 sieve, percent	..	4-10

4th. **Preparation of Mixtures:** The materials shall be mixed in a modern mixing plant, which shall be equipped with approved weighing, heating and mixing facilities. The aggregate shall be heated and dried and enter the mixer at a temperature of 150°-225° F. The mixing plants shall be reasonably close to the job so that truck deliveries can be made to the job and the mixtures spread at a temperature of 150°-225° F.

5th. **Placing Mixtures:** The mixtures shall be placed on dumping boards or metal or metal sheets rather than dumped on the roof surface, and spread into place by means of shovels and rakes to the specified depth. The depth of the mixtures may be controlled by the use of cubical blocks. Adjacent to walls and curbs, the mixtures shall be spread uniformly high so that when compacted, they will be slightly higher than the rest of the surface.

6th. **Compacting Mixtures:** After spreading, the mixtures shall be compacted by means of a power driven roller weighing not less than 3 tons. The wheels of the roller shall be kept clean at all times. They may be kept moist with water or a mixture of water with not more than 10% lubricating oil. Rolling and compaction shall continue until the mix does not creep under the roller wheels. In all places inaccessible to the roller, the required compaction shall be obtained by hand tamps. If depressions remain after rolling, more mixture shall be added at such points and firmly rolled into place.

7th. **Surface Tolerance:** A standard ten-foot straight edge for checking the surface shall be used. The surface of the finished Tarmac Wearing Surface shall be such that it will not vary more than one-fourth (1/4) inch from a ten-foot straight edge applied in any direction.

8th. **Cement Dust:** Apply cement dust lightly and uniformly over the Tarmac Wearing Surface and use stiff brooms to draw the cement dust into the surface.

FLASHINGS

All flashings shall be properly installed before the Tarmac Concrete Wearing Surface is applied and shall be adequately protected to prevent injury from traffic using the roof surface.

NOTE: It is recommended that the Contractor be approved by Koppers and that he sublet the Tarmac Concrete Wearing Surface to an approved paving contractor who has had experience with similar surfaces, and that the work be done under the general supervision of the approved contractor.

WATER COOLED ROOFS

A roof deck intended for spray pond or water cooling is preferably dead level but may have a slight incline providing that such slope does not exceed 1 inch per foot.

The specifications for Spray Pond roofing do not provide for the expansion due to ice formations in winter, it being assumed that the water will be drained from the roof when cold weather sets in. Provision could be made, however, if necessary, by installing flashings of the proper design to take care of this pressure.

Water cooled roofs operate on the principle that (1) water on the roof deflects the sun's rays and thereby cuts down summer heat within the building. (2) the evaporation of the water dissipates heat at the rate of 1,000 B.T.U. per pound of water.

Various tests show that water cooled roofs reduce the peak temperatures on the top floor of any building by 10° to 20° F. during the summer. A recent experiment showed that roof cooling would prevent 90% of the heat, due to solar radiation, from passing through roof surface into the building.

The water cooled roof may be used alone or in conjunction with air conditioning equipment. When it is an adjunct of an air conditioning system, less refrigeration will be required for cooling of the air within the structure. It should also be noted that it is possible to pipe the water required for cooling from the condenser to the roof and, if the water is expensive or scarce, it is practical to have it recycled to the air conditioning equipment.

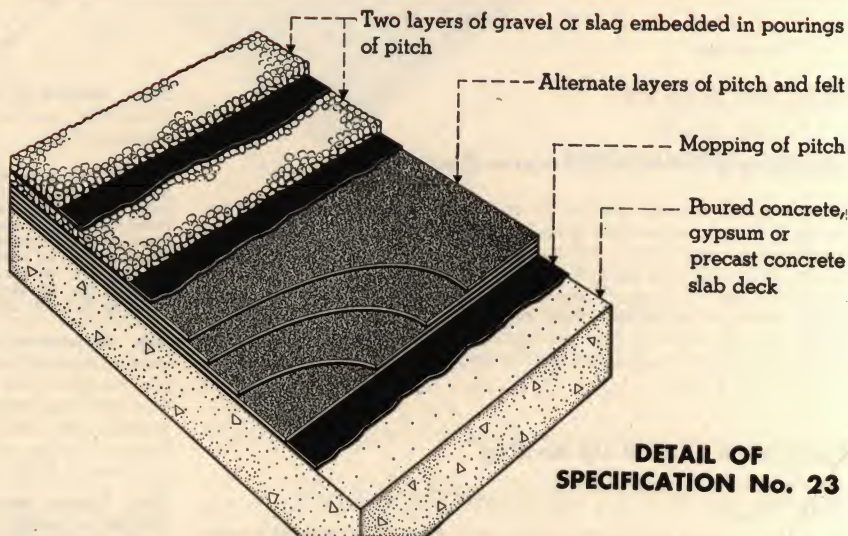
The roof should be kept wet or damp either by means of sprays or by allowing water to flow onto the surface of the roof and be retained to a certain level to form a "lake." In the warmest weather a spray system will require approximately 1/3 gallon of water per square foot per day for maximum cooling. On roofs where water is held to a specified height so as to completely cover the slag or gravel, the cooling efficiency will be less, due to the fact that the effective evaporative area has been decreased. Water cooled or spray pond roofs are similar in construction to slag or gravel roofs, with the exception that another layer of coal-tar pitch embedded slag or gravel is added.

SPRAY POND

OVER POURED CONCRETE,
POURED GYPSUM, AND
PRECAST CONCRETE SLAB
PREFERABLY DEAD LEVEL
MAXIMUM INCLINE: 1 IN. PER FT.

20 year—4 ply—Spec. No. 23

15 year—3 ply—Spec. No. 24



SPECIFICATIONS (Select clauses as required. Optional clauses in color.)

Condition of Surface to Receive Roofing

Do not apply built-up roofing to concrete surfaces which are not reasonably smooth and free from projections and holes which might cause puncture of the membrane. Surfaces must be dry. Immediately before the application of the roofing, thoroughly clean the surfaces of dust and loose material.

Application of Built-Up Roofing

1st. Mop deck completely with Koppers Old Style Pitch.

2nd. (Spec. No. 23—20 year)
Apply over the entire surface four (4) plies of Koppers Approved Tarred Felt, lapping plies twenty-seven and one-half (27½) inches.

Mop solidly between each 27½ inch lap with Koppers Old Style Pitch so that in no place shall felt touch felt.

All felt shall be turned up not less than four (4) inches at vertical surfaces.

2nd. (Spec. No. 24—15 year)
Apply over the entire surface three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-third (24⅔) inches.

Mop solidly between each 24⅔ inch lap with Koppers Old Style Pitch so that in no place shall felt touch felt.

3rd. Pour over the entire surface of the roofing membrane, a uniform coating of approximately eighty-five (85) pounds of Koppers Old Style Pitch, into which, while hot, embed not less than four hundred (400) pounds of clean dry gravel or three hundred (300) pounds of slag for each 100 sq. ft.

4th. All loose gravel or slag shall be swept from surface and a second uniform pouring of approximately ninety (90) pounds of Koppers Old Style Pitch shall be applied over the gravel or slag, into which, while hot, shall be applied a second layer of three hundred (300) pounds of gravel or two hundred (200) pounds of slag for each 100 sq. ft.

The entire surface shall then be thoroughly broomed free from all loose gravel or slag. It is advisable to roll the finished surface with a light roller so that aggregate is thoroughly embedded.

General

Pitch shall not be heated above three hundred seventy-five (375) degrees F.

WATER COOLED ROOFS (continued)

Tarred felt shall be laid without wrinkles or buckles.

Cant strips are required at all vertical surfaces.

At points where water pressure from the spray is excessive, the roof surface shall be protected with creosoted board platform or other suitable construction to break the force of the water. These platforms shall be laid on top of the roof surface and not fastened to the deck.

Material Required per 100 Sq. Ft.

MATERIAL	Spec. No. 23 (20 year)	Spec. No. 24 (15 year)
Pitch	300 lbs.	275 lbs.
Felt	60 lbs.	45 lbs.
Gravel	700 lbs.	700 lbs.
OR	OR	OR
Slag	500 lbs.	500 lbs.

BRIEF SPECIFICATION

The roofing is to be applied by a roofing contractor approved by Koppers Company, Inc., who shall apply the roofing in strict accordance with Koppers Specifications (No. 23 for 20 years, No. 24 for 15 years) and requirements, and subject to Koppers inspection and approval. Upon completion of the work, the contractor is to furnish Koppers Roofing Bond to the owner.

Koppers Roofing Bonds furnished where Koppers Inspection Service is available.

FOR BONDED FLASHINGS, refer to pages 22-23.

RE-ROOFING SPECIFICATIONS

Due to varying conditions of the roof deck and surface of the old roofing, it will be necessary for a representative of Koppers Company, Inc., to approve the type of specifications for re-roofing if a Koppers Roofing Bond is to be issued. However, in general we recommend the following practice and specifications for re-roofing work.

WHEN OLD ROOFING IS TO BE ENTIRELY REMOVED

Condition of Surface to Receive Roofing

If the old roofing membrane has disintegrated to the extent that it has little value, or if the deck and/or insulation will not render satisfactory service for the period expected of the new roofing, then all old roofing shall be entirely removed. Deck should then be made smooth and any places where it has disintegrated, or where lumber is defective, should be replaced.

Application of New Roofing

New built-up roofing shall then be applied according to the specification over the respective type of deck described in this Specification Book.

WHEN OLD ROOFING IS NOT TO BE REMOVED

Condition of Surface to Receive Roofing

If the deck and/or insulation is in satisfactory condition and will render service for the period expected of the new roofing, and the old roofing membrane can be made smooth and clean by the removal of slag, gravel, or excess asphalt coatings, it will not be necessary to remove old roofing. If new roofing is to be applied over old asphalt roofing, cut open all buckles and blisters, and remove, over which shall be applied 2 plies of Felt.

Before the application of new roofing, the surface of old roofing shall be made smooth and clean. In places where surface is slightly rough, a flood coat of Coal Tar Pitch (for pitch roofs), Asphalt (for asphalt roofs), may be applied to level the surface, or it

may be advisable to apply rigid insulation set in Asphalt (over asphalt roofs and Pitch over pitch roofs) over the entire surface of the area to be re-roofed.

Application of New Roofing

Over Tarred Felt and Pitch Roofing

New roofing shall be applied according to Koppers Specifications for over Poured Concrete Decks with the exception that on Wood Decks, 2 plies of Dry Felt shall be applied at all places where there is a possibility of pitch seepage through the deck before the application of new built-up roofing.

Over Asphalt Roofing on Decks Where Nailing Is Possible

Roofing shall be applied according to Koppers Wood Deck Specifications with the exception that the red rosin paper is to be eliminated. If new insulation is installed, apply roofing according to Koppers Specification for over Poured Concrete Decks, setting insulation in asphalt.

Over Asphalt Roofing on Decks Where Nailing Is Not Possible

Roofing shall be applied according to Koppers Concrete Deck Specifications with the exception that each lower sheet of felt shall be strip mopped to the old roofing, and these strip moppings shall be not less than 6 inches apart. If new insulation is applied, set in mopping of asphalt to old roofing.

General

All flashing, vent pipes, skylights, ventilators, parapet walls, and copings shall be replaced or properly repaired so that they will render the same length of service as the new roofing.

NOTE: Koppers Company, Inc., Guarantee Bond does not cover roof insulation or failure of roof deck. The application of a Koppers Bonded Roof over an old roof or insulation shall not constitute a waiver of these conditions.

INSULATION SPECIFICATIONS

General

The following specifications for the installation of insulation are recommended so as to provide and insure the owner the maximum effect and life of the insulation.

The roofing insulation must be kept dry both before and after application.

Koppers Company, Inc., Guarantee Bond Covering Built-Up Roofing and Flashing does not cover roof insulation nor will Koppers Company, Inc., be responsible for any damage caused by or the result of the use of insulation.

WOOD NAILING STRIPS

The general contractor shall provide wood nailing strips which shall form a nailing base under all metal flashing aprons and flanges. Strips shall be the full thickness of the insulation and shall extend not less than one (1) inch beyond the apron or flange and shall be securely fastened to the roof deck.

CANT STRIPS

Cant strips on wood decks shall be set on top of the insulation and secured by nailing through the insulation to the deck. On non-combustible decks where the cant is formed with gypsum or concrete, a square shoulder the full thickness of the insulation at the bottom of the cant shall be formed.

NAILS

Nails shall be galvanized roofing nails driven through flat tin discs, or Simplex flat head roofing nails.

Nails for use with insulation shall be of sufficient length to pass through the insulation and penetrate into, but not through, the deck construction, with the exception that on steel decks where nailing is necessary, the nails shall be soft-nosed roofing nails which shall not penetrate the steel deck.

CUT-OFFS

Cut-offs consisting of two (2) plies of tarred felt and moppings of Old Style Pitch or Asphalt extending onto the deck at least six (6) inches and four (4) inches on top of the insulation, shall be applied at the end of each day's work over exposed edges of insulation. When cork insulation is used, cut-offs should be removed when work is resumed, or should all run in one direction.

All edges of insulation adjoining parapet walls, cants, eaves, vertical surfaces, etc., shall be sealed by applying two (2) plies of Tarred Felt and moppings of Pitch or Asphalt, except when cork insulation is used.

General Application of Insulation

Insulation must be thoroughly dry and of approved type, and must be able to retain nails.

No more insulation shall be laid at any one time than can be protected by pitch and felt in case of sudden weather changes.

Edges of insulation shall be brought closely together and shall not be forced into place. Where insulation joins vertical surfaces, the insulation shall be cut in a neat manner allowing at least one-half (1/2) inch clearance.

When more than one (1) layer of insulation is used, joints between layers shall be broken. All layers shall be parallel to preceding layers.

OVER WOOD, PRECAST GYPSUM, GYPSUM STEEL DECKS. FOR NORMAL CONDITIONS

Insulation Specification No. 200

Application of Insulation

The roof deck shall be covered with one (1) layer of red rosin sheathing paper weighing not less than five (5) pounds per one

hundred (100) square feet. Sheathing paper shall be lapped two (2) inches and secured to the deck by occasional nailing. Over Precast Gypsum and Gypsum Steel Decks, sheathing paper may be omitted.

Sheathing paper may be omitted when insulation is laid in two (2) layers providing there are no pitch moppings between the layers.

On decks having inclines up to two (2) inches per foot, each sheet of insulation shall be secured to the deck by nails at each of the four corners and on inclines exceeding two (2) inches per foot, nails are to be spaced one (1) foot apart, and stagger nailed through the longitudinal center of each sheet. All nails shall penetrate the deck at least three-fourths (3/4) inch. Nailing of two layers of insulation shall be through the second or top layer only.

Application of Roofing Above Insulation

If more than one layer of insulation is installed and joints broken or if ship-lap type is used, roofing above insulation shall be constructed according to Koppers Specifications No. 5, No. 6, No. 7, No. 8, No. 9, No. 32 or No. 33.

If only one layer of insulation is installed or if ship-lap type is not used, the roofing shall be applied according to Koppers Specifications No. 1, No. 2, No. 4, No. 30, No. 3, No. 25 or No. 31, on wood decks, with the exception that the red rosin paper may be omitted; and according to Specifications No. 12, No. 13, No. 14, No. 26, No. 34 or No. 35 on Precast Gypsum or Gypsum Steel Plank Decks.

OVER WOOD, PRECAST GYPSUM AND GYPSUM STEEL DECKS. FOR HIGH HUMIDITY

Insulation Specification No. 201

Application of Membrane Below Insulation

1. The wood roof deck shall be covered with one (1) layer of red rosin sheathing paper weighing not less than five (5) pounds per one hundred (100) square feet. The sheathing paper shall be lapped two (2) inches and secured to the deck by occasional nailing. On precast gypsum or gypsum steel plank, sheathing may be omitted.

2. Two full thicknesses of Tarred Felt shall be laid over the entire surface, lapping each sheet nineteen (19) inches over the preceding sheet and nailing as often as may be necessary to hold the sheets in place.

Extend all felts up vertical surfaces not less than eight (8) inches. After the insulation has been laid, turn these eight (8) inch extensions down over the exposed surface of the insulation and thoroughly mop with Old Style Pitch when installing flat roofs, and steep pitch when installing steep roofs.

Application of Insulation

1. Mop the entire surface with a uniform coating of Old Style Pitch into which, while hot, firmly embed the insulation. When roofs have an incline of from two (2) inches to five (5) inches per foot, use Steep Roofing Pitch.

2. On decks having inclines up to five (5) inches per foot, each sheet of insulation shall be secured to the deck by nails at each of the four corners, and on inclines exceeding five (5) inches per foot, nails are to be spaced one (1) foot apart along edges and stagger nailed through the longitudinal center of each sheet. All nails shall penetrate the deck at least three-fourths (3/4) inch. Nailing of two layers of insulation shall be through the second or top layer only.

When insulation is laid in two layers, mop the entire surface of the first layer with Old Style Pitch on flat roofs and Steep Pitch on steep roofs into which, while hot, embed the second layer of insulation. (This is optional.)

Application of Roofing Above Insulation

Roofing shall be applied according to Koppers Specifications No. 5, No. 6, No. 7, No. 8, No. 9, No. 32 or No. 33.

INSULATION SPECIFICATIONS (continued)

OVER POURED CONCRETE, GYPSUM AND PRE-CAST CONCRETE SLAB. FOR NORMAL CONDITIONS

Insulation Specification No. 202

FOR FLAT DECKS

Application of Insulation

1. Apply a uniform coating of Old Style Pitch to the deck.

If precast concrete slab or tile deck, strip or spot mop with Old Style Pitch up to four (4) inches from the edge of each joint. While the pitch is hot immediately embed the insulation.

2. If there are two (2) layers of insulation, mop the entire first layer with Old Style Pitch into which, while hot, embed the second layer of insulation.

FOR STEEP DECKS (Incline 2 to 5 Inches per Ft.)

Application of Insulation

1. Apply a uniform coating of Steep Roofing Pitch to the deck into which, while hot, embed the insulation.

On precast tile or slab deck, spot or strip mop with Steep Roofing Pitch up to four (4) inches from the edge of each joint.

2. If there are two (2) layers of insulation, the entire first layer shall be coated with Steep Roofing Pitch into which, while hot, embed the second layer of insulation. Each sheet of insulation shall be secured in place by nailing. If two (2) layers of insulation are used nailing shall be through the top layer only. Nails shall be spaced one (1) foot apart and shall penetrate the deck at least three-quarters ($\frac{3}{4}$) of an inch and shall be spaced along the edge and stagger nailed through the longitudinal center of each sheet of insulation.

When the deck will not permit nailing (which necessitates nailing strips), insulation shall be secured to each nailing strip with nails spaced approximately one (1) foot apart.

Application of Roofing Above Insulation

The roofing shall be applied according to Koppers Company, Inc.'s Specifications Nos. 5, 6, 7, 8, 9, 20, 23, 24 or 33.

OVER POURED CONCRETE, GYPSUM AND PRE-CAST CONCRETE SLAB FOR HIGH HUMIDITY

Insulation Specification No. 203

FOR FLAT DECKS

Application of Membrane Below Insulation

1. Apply a uniform coating of Old Style Pitch to the deck. On precast concrete slab or tile deck, spot or strip mop with Old Style Pitch up to four (4) inches from the edge of each joint.

2. Lay over the entire surface two (2) full thicknesses of Koppers Approved Tarred Felt, lapping each sheet nineteen (19) inches over the preceding sheet—mopping with Old Style Pitch the full nineteen (19) inches so that in no place shall felt touch felt.

3. Extend all plies of felt up vertical surfaces not less than eight (8) inches and after insulation has been installed turn this eight (8) inch extension down over the exposed edge of insulation and thoroughly mop with coal tar pitch.

Application of Insulation

Apply a uniform coating of Old Style Pitch over the entire surface into which, while hot, embed the insulation. If there are two (2) layers of insulation mop the entire surface of the first layer with Old Style Pitch into which, while hot, embed the second layer of insulation.

Application of Roofing Above Insulation

The roofing shall be applied according to Koppers Company, Inc.'s Specifications Nos. 5, 6, 7, 20, 23, or 24.

FOR STEEP DECKS (Incline 2 to 5 Inches per Ft.)

Application of Membrane Below Insulation

1. Apply a uniform coating of Steep Roofing Pitch to the deck. On precast concrete or tile, spot or strip mop with Steep Pitch up

to four (4) inches from the edge of each joint.

2. Lay over the entire surface two (2) full thicknesses of Koppers Approved Tarred Felt at right angles to the incline of the roof lapping each sheet nineteen (19) inches over the preceding sheet.

Each sheet shall be nailed with one (1) inch barbed roofing nails through flat tin discs eight (8) inches from the upper edge and nails shall be spaced not more than one (1) foot apart. Where nailing strips are used the felt shall be nailed with two (2) nails through flat tin discs at each nailing strip placed six (6) inches and eight (8) inches respectively from the upper edge of each sheet.

3. Extend all plies of felt up vertical surfaces not less than eight (8) inches and after insulation has been installed turn this eight (8) inch extension down over the exposed edge of insulation and thoroughly mop with Steep Pitch.

Application of Insulation

Apply a uniform coating of Steep Roofing Pitch over the entire surface into which, while hot, embed the insulation. Each sheet of insulation shall be secured in place by nailing. Nails shall be spaced approximately one (1) foot apart and shall penetrate the deck at least three-fourths ($\frac{3}{4}$) of an inch and shall be placed along edge and stagger nailed through the longitudinal center of each sheet of insulation.

When the deck will not permit nailing (which necessitates providing nailing strips), insulation shall be secured to each nailing strip with nails spaced approximately one (1) foot apart. Nailing of two layers of insulation shall be through the top layer only. Do not nail the first layer.

Application of Roofing Above Insulation

The roofing shall be applied according to Koppers Company, Inc.'s Specifications Nos. 8 and 32.

OVER STEEL DECKS FOR HIGH HUMIDITY

Insulation Specification No. 204

NOTE: Koppers Company, Inc., will not bond roofing over steel decks unless the steel deck is insulated.

Application of Membrane Below Insulation

1. Mop the steel deck with Steep Asphalt.
2. Lay over the entire surface two (2) full thicknesses of fifteen (15) pound Asphalt Felt, lapping each sheet nineteen (19) inches over the preceding sheet, mopping with Steep Asphalt the full width of the nineteen (19) inch lap.

Extend all felts up on vertical surfaces not less than eight (8) inches. After the insulation has been laid turn these eight (8) inch extensions down over the exposed surface of the insulation and thoroughly mop with Old Style Pitch when installing flat roofs and Steep Pitch when installing Steep Roofs.

Application of Insulation

Apply a uniform coating of Steep Asphalt into which, while hot, embed the insulation.

When more than one (1) layer of insulation is applied, the top surface of each layer shall be coated with Steep Asphalt into which, while hot, embed the succeeding layer.

When the incline of the roof exceeds one (1) inch per foot, the insulation shall be secured to the deck through the top layer with the proper devices provided by the deck manufacturer.

Application of Roofing Above Insulation

The roofing shall be installed according to Koppers Company, Inc.'s Specifications Nos. 17, 18, 19 or 36 above insulation.

OVER FOAMGLASS INSULATION

Application of roofing to be the same as over other types of rigid insulation on flat roofs where nailing is not necessary. We will not bond roofing when nailing of insulation or felts over insulation is required.

OVER CONCRETE VERMICULITE INSULATION

When the mix has had sufficient time to set up to withstand normal traffic (subject to Koppers approval) roofing shall be applied according to Specifications Nos. 12, 13 with the exception that nails shall not be used and first two plies of felt shall be secured by spot mopping or sprinkling of pitch.

KOPPERS FLASHING

Flashings should be installed at all intersections formed by vertical surfaces, at all changes of pitch, and wherever stacks, chimneys or other structures penetrate the roof. Their importance cannot be stressed too strongly—the value of a good roof installation will be completely lost if inadequate or poorly installed flashings are employed.

Koppers flashings are an integral part of a Koppers roof. Designed for flexibility so that slight movements do not dislodge them and fastened securely to the wall, they give many years of service.

Flashing is not only affected by expansion and contraction of the material itself, but also by the expansion and contraction of the construction to which it is attached. In addition, the effects of disintegration and its resulting harm to the flashing adhesion must be taken into consideration since this action will eventually separate flashing from the wall. For this reason it is particularly

important that the top edges of the flashing be protected by counter-flashing which will insure a diversion of the water away from any opening that might develop between flashing and wall.

ROOFING AND FLASHING BRIEF SPECIFICATION

Flashing and roofing shall be installed by a roofing contractor approved by Koppers Company, Inc., and he shall apply the roofing and flashing in strict accordance with Koppers Specifications and requirements for 10, 15 or 20 year bonds, and subject to Koppers inspection and approval. Upon completion of the work, the contractor is to furnish Koppers Roofing and Flashing Bond to the owner.

The flashing can be bonded for no longer period than the roof is bonded.

COMPOSITION BASE AND METAL CAP FLASHINGS

20 year—Specification No. 107

15 year—Specification No. 106

Application

Extend plies of roofing felts and pitch mopping up all walls, parapets and curbs for a distance of two (2) inches above cant strip.

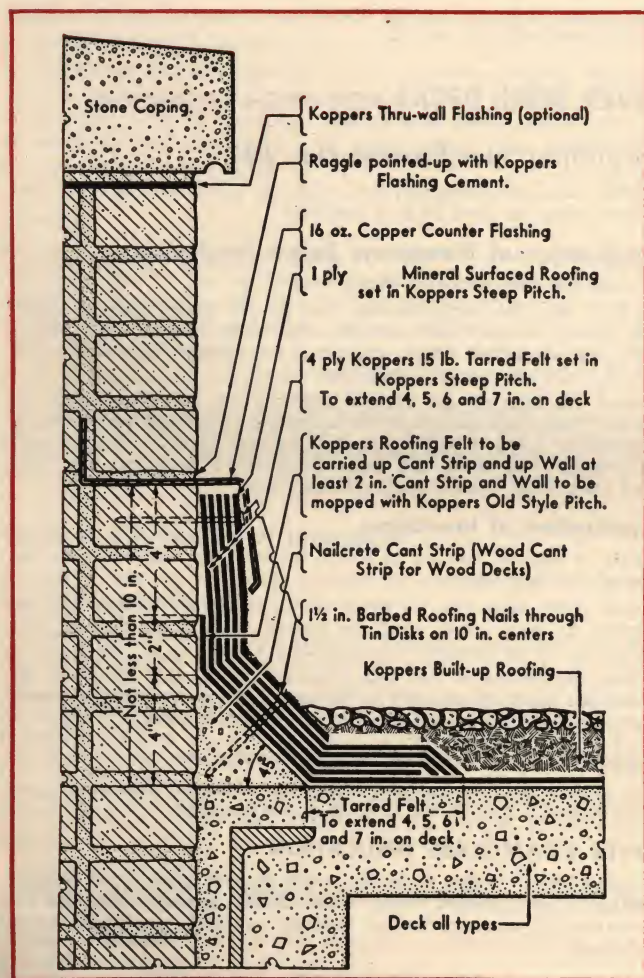
A raggle not less than ten (10) inches above the roof deck is to be provided.

Mop on with Koppers Steep Pitch a strip of tarred felt extending from the raggle of not less than two (2) inches on the roof deck.

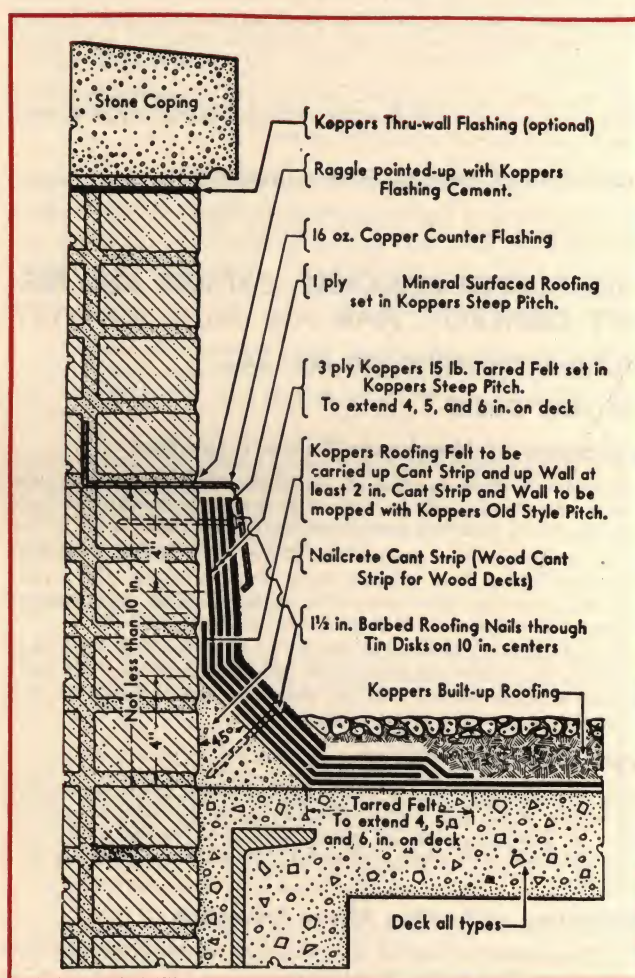
On top of this apply a second strip of tarred felt with moppings of hot Steep Pitch, extending the felt onto the roof deck one (1) inch beyond the preceding strip. Mop on additional strips in a similar fashion until a four ply 20 year Specification No. 107 or a three-ply 15 year Specification No. 106 reinforcement has been obtained.

Nail the top ply of flashing reinforcement on center line of cant with one and one-half (1½) inch barbed roofing nails through flat tin discs on ten (10) inch centers.

(Continued next page)



Koppers 20-Year Bonded Flashing
Specification No. 107



Koppers 15-Year Bonded Flashing
Specification No. 106

We suggest that when it is impossible to obtain the type or grade of metal indicated in our flashing specifications, or drawings, you substitute whatever type is available.

FLASHINGS SPECIFICATIONS (continued)

Mop on with hot steep roofing pitch a strip of 85 pound mineral surface roofing felt of sufficient width to extend from the raggle to the surface of the deck. Nail with one and one-half (1½) inch barbed roofing nails through flat tin discs at upper edge approximately ten (10) inches o.c. (For brick construction, nail into vertical mortar joints. For concrete construction nail to creosoted wood nailing strips set in flush with the surface.)

Tarred Felt or mineral surface roofing felts are not to exceed ten foot three inches (10'3") in length. Ends of connecting strips are to overlap three (3) inches and are to break at least twenty-four (24) inches with end laps of underlying strip. End laps shall be thoroughly mopped with steep pitch.

All plies of felt shall be firmly pressed into moppings of steep pitch so that there will be no wrinkles in the finished surface.

COMPOSITION BASE AND METAL CAP FLASHING

10 year—Specification No. 101

Application

Extend plies of roofing felts and pitched moppings up all walls, parapets and curbs for a distance of not less than six (6) inches above the roof deck.

A raggle of not less than ten (10) inches above the roof deck is to be provided.

Mop on with Koppers Steep Roofing Pitch a strip of Tarred Felt extending from a height of not less than ten (10) inches on the perpendicular surface to four (4) inches out on the roof deck. On top of this apply a second strip of tarred felt with moppings of hot steep roofing pitch, extending the roofing felt onto the roof deck one (1) inch beyond the preceding strip.

Mop on with Hot Steep Roofing Pitch a strip of 85 pound mineral surface roofing felt of sufficient width to extend from the raggle to the surface of the deck. Nail with one and one-half (1½) inch barbed roofing nails through flat tin discs at upper edge approximately ten (10) inches o.c.

(For brick construction, nail into vertical mortar joints. For concrete construction, nail to creosoted wood nailing strips set in flush with the surface.)

Tarred felt or mineral surface roofing felts are not to exceed ten foot three inches (10'3") in length. Ends of connecting strips are to overlap three inches and are to break at least twenty-four (24) inches with end laps of underlying strips. End laps shall be thoroughly mopped with steep pitch.

Koppers Plastipitch Metal Cap Flashing

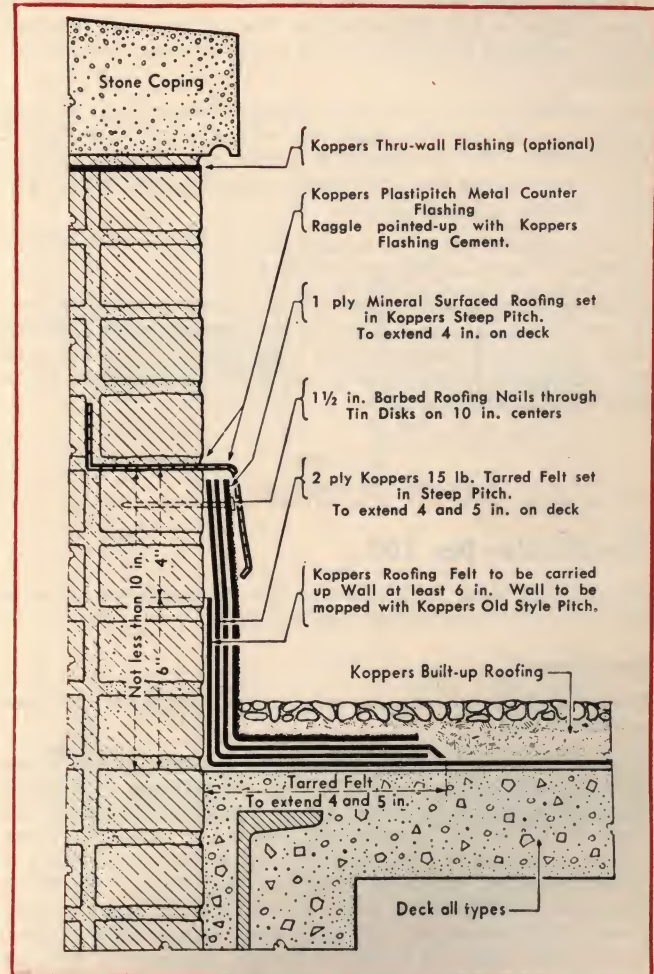
A Plastipitch metal cap flashing is to be inserted in the raggle immediately upon completion of base flashing. The cap flashing is to extend into the raggle not less than two (2) inches and is to have not less than a four (4) inch exposed apron extending down over the base flashing. Completely fill the raggle groove with Koppers flashing cement.

Metal Cap Flashing (Not Bonded)

Metal cap flashing is to be inserted in the raggle immediately upon completion of base flashings. The cap flashing is to extend onto the raggle not less than two (2) inches and is to have not less than a four (4) inch exposed apron extending down over base flashing.

Completely fill raggle groove with Koppers Flashing Cement.

NOTE: If a Koppers 10, 15 or 20 year Flashing Bond is required, the flashing must be installed in connection with a Koppers Bonded Roof. The flashing can be bonded for no longer period than the roof is bonded.



Koppers 10-Year Bonded Flashing
Specification No. 101

METAL CAP AND BASE FLASHING (Not Bonded)

Specification No. 100

Where a metal base flashing is used, felt reinforcement at all wall angles, skylight curbs and other vertical surfaces shall be installed as follows before metal base flashing is installed.

For Wood and Precast Gypsum Decks:

Extend first two (2) plies of dry roofing felt up vertical surfaces for a distance of not less than four (4) inches and cut off the remaining plies at the angle of the roof deck.

For Concrete or Poured Gypsum Decks:

Terminate plies of roofing membrane at vertical surfaces.

Mop on with Koppers Steep Pitch a strip of tarred felt extending from a distance of not less than six (6) inches (or the height of the raggle) up the perpendicular surface to not less than four (4) inches out on flat roofing membrane. On top of this apply a second strip of tarred felt set in mopping of steep roofing pitch, extending not less than one (1) inch beyond edge of preceding strip. If 5 ply flat roofing is installed, a third reinforcing ply of felt set in steep pitch is to be applied. (Continued next page)

We suggest that when it is impossible to obtain the type or grade of metal indicated in our flashing specifications, or drawings, you substitute whatever type is available.

FLASHINGS

SPECIFICATIONS (continued)

Mop the surface of last ply immediately before installing metal base flashing so that metal base flashing is set in hot pitch.

All end joints of reinforcing plies shall break joints and all end laps shall be thoroughly mopped.

Installation of Metal Base and Counter Flashing

A raggle not less than ten (10) inches above the roof deck is to be provided.

The metal base flashing shall extend up the vertical surface not less than ten (10) inches and onto the roof deck not less than four (4) inches. Nail base flashing to the deck with one and one-half (1½) inch barbed roofing nails one (1) inch from outer edge of metal flange on four (4) inch center. For concrete deck, a nailing strip of creosoted wood shall be set in the concrete flush with the surface.

Over the part of the metal base flashing extending onto the roof, apply two (2) strips of tarred felt with alternate moppings of roofing pitch. The top strip is to extend two (2) inches beyond the lower strip and both are to be not less than double the width of the flange.

Metal cap flashing shall be installed immediately so as to prevent seepage of water behind base flashing.

Metal cap flashing shall extend into the raggle not less than two (2) inches and shall have a four (4) inch exposed apron extending down over the top edge of metal base flashing. After the metal cap flashing has been installed, completely fill the raggle groove with Koppers flashing cement.

RAGGLE BLOCK FLASHING

Specification No. 102

Raggle block shall be installed so that the raggle groove is in direct line with the cant strip. (See drawing.)

Application

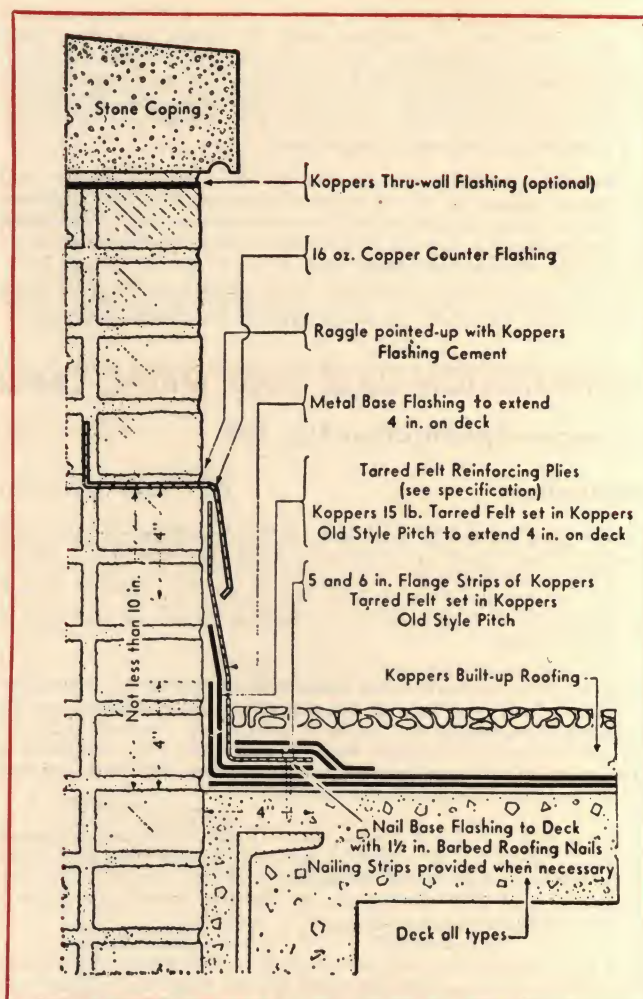
Extend all plies of roofing felt and moppings of pitch up the cant to the wall angle.

Remove all foreign material from groove in raggle block. Trowel with Koppers Flashing Cement the underside of a strip of tarred felt (extending from two (2) inches out on the roof deck into the full depth of the raggle groove) and immediately press into place. On top of this apply a second strip of tarred felt and troweling of Flashing Cement. Trowel on additional plies until a 3 ply (for 15 year type) or 4 ply (for 20 year type) reinforcement has been completed. Each reinforcement ply shall extend beyond lower ply onto the roof deck. Nail the top ply of flashing reinforcement with one and one-half (1½) inch barbed roofing nails through flat tin discs on ten (10) inch centers in middle of cant. Apply into Koppers Flashing Cement a strip of 85 pound mineral surface roofing felt of sufficient width to extend not less than three (3) inches out on the roof deck and into the full depth of the raggle groove. Fill raggle completely with Koppers Flashing Cement.

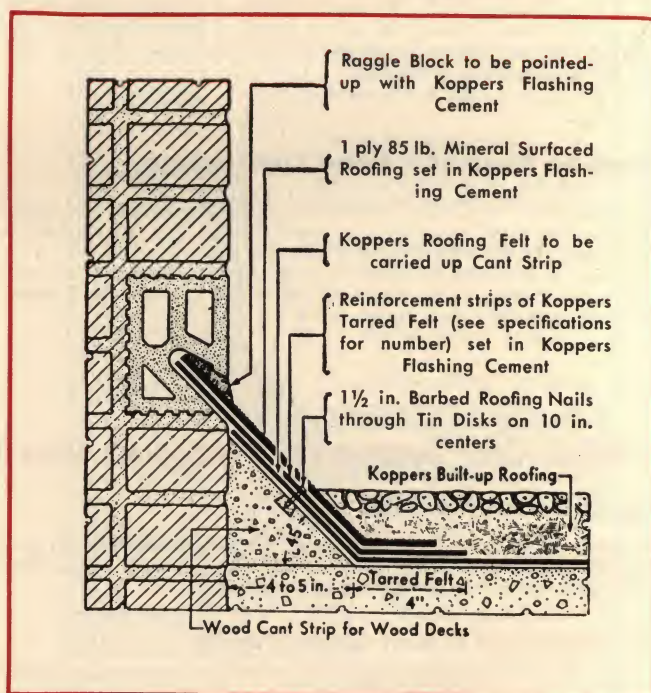
Tarred Felt and mineral surface roofing shall be free from wrinkles.

The strips of Mineral Surface Roofing shall be cut from across the roll so that the end of each strip shall have a two (2) inch selvage. The two (2) inch selvage shall be coated with Flashing Cement and shall be overlapped by the overlying sheet and be thoroughly pressed into place.

NOTE: If a Koppers 10, 15 or 20 year Flashing Bond is required, the flashing must be installed in connection with a Koppers Bonded Roof. The flashing can be bonded for no longer period than the roof is bonded.



Koppers Flashing Specification No. 100 (Not Bonded)

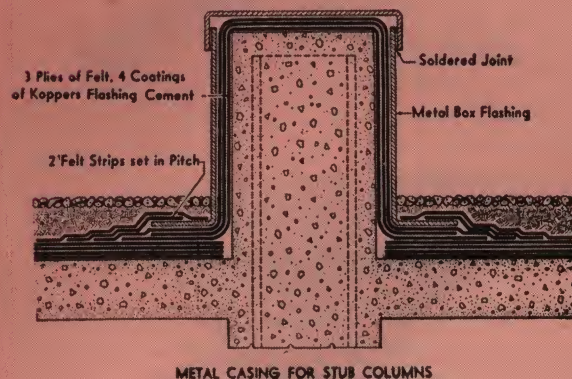
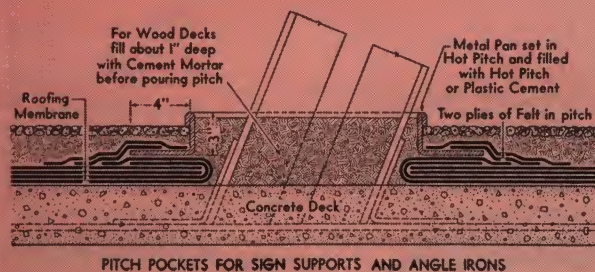
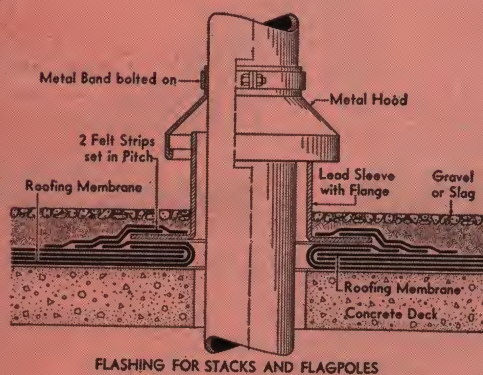
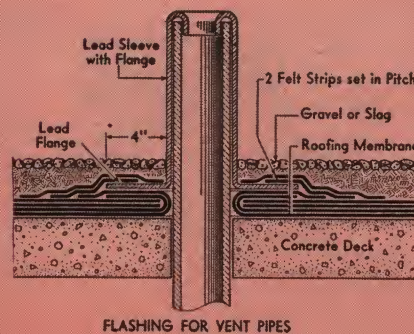
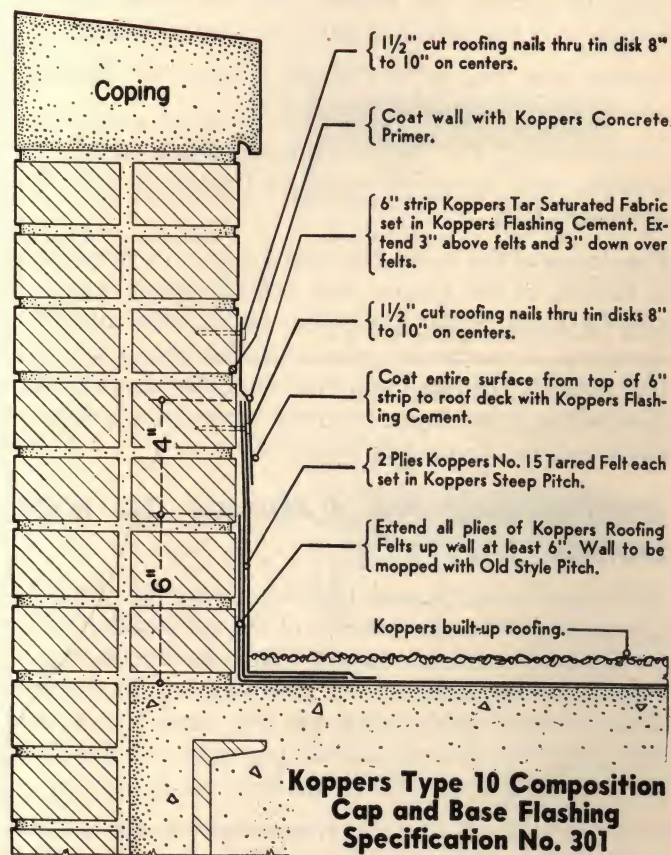


Koppers Raggle Block Flashing Specification No. 102

We suggest that when it is impossible to obtain the type or grade of metal indicated in our flashing specifications, or drawings, you substitute whatever type is available.

KOPPERS NO-METAL FLASHINGS

8a
6



OTHER FLASHINGS

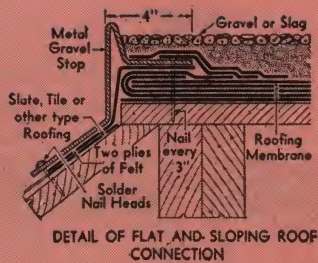
SPECIFICATIONS FOR FLASHINGS ON VENT PIPES, STACKS, FLAGPOLES, AND OTHER PROJECTIONS.

All (. . . vent pipes . . . stacks . . . flagpoles . . . or other projections . . .) penetrating the built-up roofing, whether indicated on drawings or not, are to have a proper metal (. . . sleeve flashing with flange . . . pan flashing with flange . . . or . . . other flanged flashing . . .) installed.

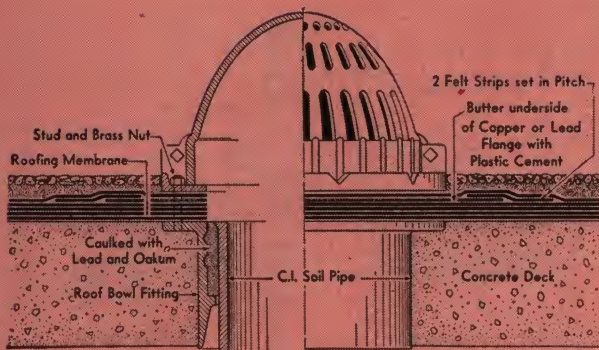
The sheet metal flange is to be cemented to the surface of the felt with a mopping of hot coal-tar pitch. Over flange apply, with alternate moppings, 2 reinforcing plies of tarred felt so that the first extends not less than three (3) inches beyond the outer edge of the flange and the second not less than six (6) inches. See detail, this page.

SPECIFICATIONS FOR FLASHINGS ON STUB COLUMNS.

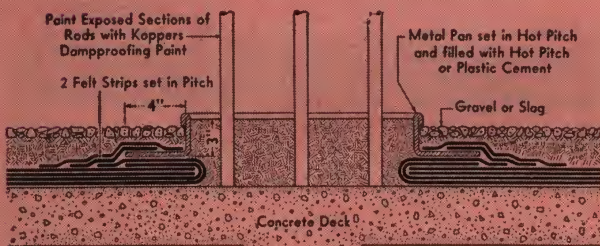
Exposed surface of all stub column projections are to be protected with 3 plies of tarred roofing felt cemented on with a trowel application of Flashing Cement. Felt is to be carried out onto the surface of the roofing felts so that the first extends not less than



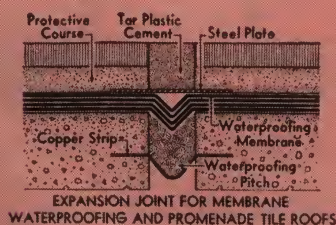
DETAIL OF FLAT AND SLOPING ROOF CONNECTION



ROOF DRAIN FOR WOOD OR CONCRETE DECK



PITCH POCKETS FOR COLUMNS



EXPANSION JOINT FOR MEMBRANE WATERPROOFING AND PROMENADE TILE ROOFS

three (3) inches, the second not less than four (4) inches, and the third not less than five (5) inches.

Trowel over the entire surface of felts just applied, one (1) coat of Flashing Cement.

All stub column projections are to have a metal box flashing with flange furnished and installed over the cemented felts.

The flange of the metal box flashing is to be cemented to surface of the roofing felts with a mopping of hot coal-tar pitch. Over the flange apply with alternate moppings, 2 reinforcing plies of tarred felt so that the first extends not less than three (3) inches beyond the outer edge of the flange, and the second not less than six (6) inches. See detail, page 25.

SPECIFICATIONS FOR FLASHINGS ON ROOF DRAINS.

The sheet metal flange furnished with the drain is to be cemented to the surface of the felt with hot coal-tar pitch or flashing cement. Over the flange apply with alternate moppings or trowelings 2 reinforcing plies of tarred felt so that the first extends not less than three (3) inches beyond the outer edge of the flange, and the second not less than six (6) inches.

Roof drains should be of a type provided with a wide lead or copper flange. Strainer construction should provide adjustment for meeting variations in roof level or slope. See detail, this page.

SPECIFICATIONS FOR FLASHINGS ON PITCH POCKETS FOR FUTURE COLUMNS.

At all locations where future columns are to penetrate built-up roofing, pitch pockets are to be provided with a flanged metal pan.

The sheet metal flange is to be cemented to the surface of the felt with flashing cement. Over the flange apply, with alternate moppings, 2 reinforcing plies of tarred felt so that the first extends not less than three (3) inches beyond the outer edge of the flange and the second not less than six (6) inches.

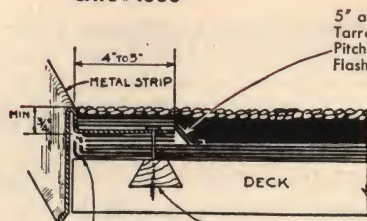
Fill metal pan with hot coal-tar pitch or flashing cement. Paint exposed sections of all reinforcing rods with dampproofing paint. See detail, this page.

SPECIFICATIONS FOR EXPANSION JOINTS

Membrane waterproofing is to be applied on all expansion joints. Membrane is to be supported top and bottom by metal or other stable construction designed to meet the service conditions. Sheet copper pan (illustrated in drawing) is to be cast in place when the slab is poured. Where this is not feasible the copper may be set on top of the slab, directly under the membrane.

FOR GRAVEL AND SLAG ROOFING WITHOUT INSULATION

EAVE # 1000



FLAT ROOFS

Nails, spaced 1" from edge of metal strip and 3" apart.

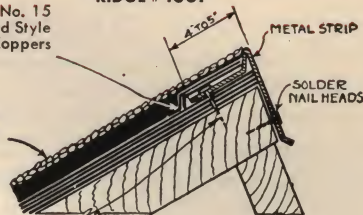
Creosoted wood nailing strip furnished when deck does not permit nailing.

Two lower plies of roofing felt are to be turned up over top plies of felt and run back on deck at least five inches.

5" and 6" flange strips of Koppers No. 15 Tarrd Felt embedded in Koppers Old Style Pitch. (On No. 1001, embed in Koppers Flashing Cement.)

Slag embedded in Koppers Steep Pitch.

RIDGE # 1001

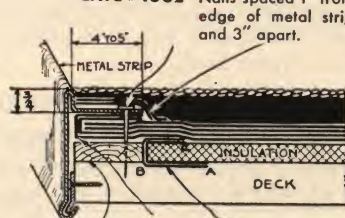


METAL STRIP

SOLDER NAIL HEADS

FOR GRAVEL AND SLAG ROOFING WITH INSULATION

EAVE # 1002



FLAT ROOFS

Creosoted edging strip. See note opposite.

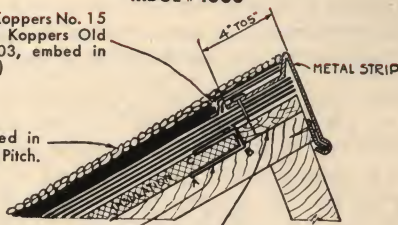
Two lower plies of roofing felt are to be turned up over top plies of felt and run back on deck at least 5".

Nails spaced 1" from edge of metal strip and 3" apart.

5" and 6" flange strips of Koppers No. 15 Tarrd Felt embedded in Koppers Old Style Pitch. (On No. 1003, embed in Koppers Flashing Cement.)

Slag embedded in Koppers Steep Pitch.

RIDGE # 1003



METAL STRIP

Note: Creosoted wood edging strip securely fastened to deck cut to the same width as metal flange and the thickness of the insulation.

Edge of insulation to be sealed with 2 plies tarrd felt strips, extending 6" under insulation and 5" over insulation.

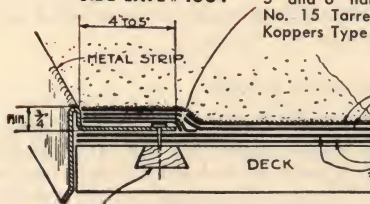
With concrete, poured gypsum, precast concrete and book tile decks, mop with pitch from points A to C. On steel decks with Koppers Type S Asphalt.

With wood and precast gypsum decks, mop with pitch from points B to C and nail felt strips securely to deck.

When there is waterproofing under insulation, extend waterproofing plies of felt and moppings of pitch so that they can be turned back over the top of insulation 5".

FOR MINERAL SURFACED ROOFING WITHOUT INSULATION

SIDE EAVE # 1004



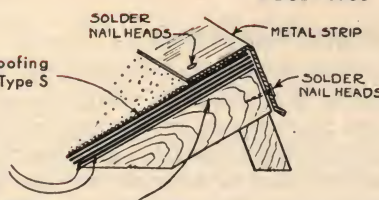
Nails spaced 1" from edge of metal strip and 3" apart. Creosoted wood nailing strip furnished when deck does not permit nailing.

5" and 6" flange strips of Koppers No. 15 Tarrd Felt embedded in Koppers Type S Asphalt.

Mineral surfaced roofing embedded in Koppers Type S Asphalt.

Two ply Koppers No. 15 Tarrd Felt nailed to deck in the case of wood or precast gypsum decks. 1 ply felt embedded in Koppers Type S Asphalt in the case of concrete, poured gypsum, steel deck, etc.

RIDGE # 1005



SOLDER NAIL HEADS

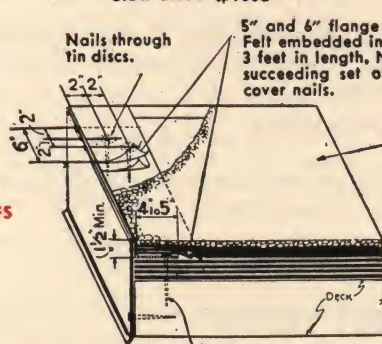
METAL STRIP

SOLDER NAIL HEADS

Creosoted wood nailing strip furnished when deck does not permit nailing

FOR STEEP SLAG ROOFS

SIDE EAVE # 1008



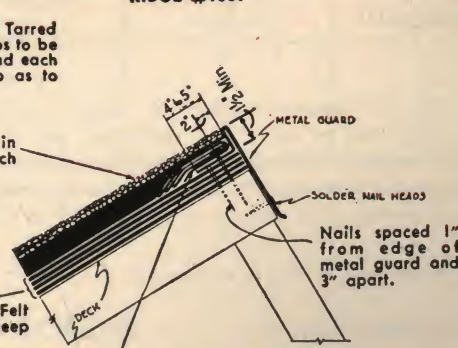
Nails spaced 1" from edge of metal guard and 3" apart.

5" and 6" flange strips of Koppers No. 15 Tarrd Felt embedded in Koppers Steep Pitch. Strips to be 3 feet in length. Nailed to deck as shown and each succeeding set of strips to lap over 6" so as to cover nails.

Slag embedded in Koppers Steep Pitch

Koppers No. 15 Tarrd Felt embedded in Koppers Steep Pitch. (No. of plies as specified)

RIDGE # 1009



METAL GUARD

SOLDER NAIL HEADS

Nails spaced 1" from edge of metal guard and 3" apart.

12" and 14" flange strips of Koppers No. 15 Tarrd Felt embedded in Koppers Steep Pitch. Folded in half and the underside of the fold nailed through tin discs spaced 1" apart as shown with the top side turned down so as to cover the nail head with two plies of felt and moppings of pitch.

We suggest that when it is impossible to obtain the type or grade of metal indicated in our flashing specifications, or drawings, you substitute whatever type is available.

WATERPROOFING-DAMPPROOFING

GENERAL

1. **WATERPROOFING** is employed to prevent water under pressure from entering the building or to resist the erosive action of running water.

2. **MEMBRANE WATERPROOFING** provides a continuous blanket which seals the entire area of the surface protected. It consists of a strong and elastic fabric or felt membrane mopped on with coal-tar pitch. It is applied to the water side of the construction to be protected. The water pressure pushes the membrane against the walls and floors and thus tends to preserve the contact between the membrane and the construction.

3. **DAMPPROOFING** is intended to render the surface of a material impermeable to water intermittently present in small quantities and not amounting to a head of water pressure. It is therefore evident that while waterproofing is also naturally and inherently damp-proofing, dampproofing can **not** be waterproofing.

Dampproofing generally consists of a water-repellent surface coating applied by brush, spray or trowel. A good dampproofing will penetrate into and fill the pores of a surface, is sufficiently elastic to conform to expansion and contraction, and is insoluble in and unaffected by acids or alkalis that may come in contact with it either in the water it is intended to repel or the surfaces to which it is applied.

4. **THROUGH-WALL FLASHING**, employing tarred fabric cemented with a flashing cement, is designed to prevent the penetration of intermittently present water through a wall or similar construction by diverting the direction of flow. It is essentially the same as dampproofing in principle, but differs in that dampproofing is generally an all-over surface treatment, while flashing is restricted to a vulnerable point.

Why Coal Tar Materials Should be Used

The function of waterproofing and dampproofing is to protect masonry or concrete from attacks by water. The most important property that must be possessed by any waterproofing or dampproofing material is ability to resist prolonged contact with water. It cannot be assumed that all materials used for this work are actually resistant to water. True water-resistance is obtained with coal tar pitches. This is proved by the records of 30, 40 or even more years of leak-proof service life from coal tar pitch roofs and by the fact that coal tar pitch on water-cooled roofs is constantly or intermittently exposed to water for years without damage.

WATERPROOFING

PITCH

Koppers Coal Tar Waterproofing Pitch is manufactured by distilling blends of coal tars to the proper consistency for waterproofing work. It is resistant to attack by termites, is self-healing and self-sealing if slight breaks occur in the pitch and it possesses a ductility which permits it to conform to irregularities in waterproofed surfaces.

Koppers Waterproofing Pitch complies with the following specifications:

A.S.T.M. D-450-41 Type B

Federal Specification R. P. 381—Type II

Underwriters' Laboratories

FABRIC

Open-mesh cotton fabric is thoroughly saturated with coal tar pitch by being passed successively through hot melted pitch and hot squeeze rolls. In Koppers Waterproofing Fabric, the cotton weighs not less than four ounces per square yard before treatment and not less than 11 ounces after treatment.

The finished fabric is sufficiently porous to permit the moppings of hot waterproofing pitch to seep through during the application of the waterproofing and become firmly anchored in place.

Koppers Tar Saturated Waterproofing Fabric complies with the following specifications:

A.S.T.M. D-173-42

Federal Specifications HH-C-591

WHEN TO USE FABRIC

Fabric has greater strength than felt and is especially effective where vibration or deflection is encountered. It is particularly recommended under heavily-loaded columns, on machine isolation and on railroad track isolation in buildings, as well as on bridges, roadways, tunnels, etc. It is also used on waterproofing where no protection course is to be used. In corners, angles and on irregular surfaces, it can be applied without entrapping air, thus making a firmer bond.

FELT

Dry rag felt is produced by the "felt" of fibers of vegetable and animal origin. The dry felt is passed through a hot bath of coal tar and hot squeeze rolls. Koppers Tar-saturated Felt increases in weight not less than 140% during saturation. The felt most frequently used in waterproofing weighs 15 pounds per 108 square feet.

WHEN TO USE FELT

Felt is sometimes used in alternate layers with fabric, or is used in the first plies and covered with fabric on the outermost ply. Felt, when mopped with pitch, increases the impermeability of membrane waterproofings.

Fabric membranes are not superior to felt except in their greater toughness and strength.

PROTECTION COURSE

In swimming pools, shower baths, dairy and hotel kitchen floors, a course of cement concrete is applied against the waterproofing and is used as a bedding course for the vitrified brick, tile or other surface. On bridge decks, elevated highways and ramps, protection courses and wearing surfaces may be made of brick, granite block, cement concrete or bituminous materials.

On culverts and bridge arches, the protection course is sometimes omitted, and gravel or other fill, free from cinders and sharp stone, is placed directly upon the waterproofing.

In tunnels, subways, sidewalk vaults, sub-basements and reservoirs, the waterproofing may be placed between two courses of cement concrete.

DAMPPROOFING

Dampproofing applications are usually made with Koppers HP Primer and Koppers Seal Coat.

HP Primer penetrates the surface of the concrete and makes it water-repellent.

Seal Coat seals the surface and protects it from erosion.

Koppers Lumino is used over HP Primer when an aluminum finish is desired. Lumino is a bituminous-base paint which contains a chemically-processed tar base fluxed with highly refined solvents and Alcoa Albron Aluminum Powder. It produces two protecting films with one application and one labor cost.

Koppers High Penetration Primer meets the following specification:

U.S. Bureau of Public Roads TW-1-X.

Koppers Seal Coat meets the following specification:

U.S. Bureau of Public Roads RT-143 Type RTCB-5, RTCB-6.

MEMBRANE WATERPROOFING

GENERAL SPECIFICATIONS

Preparation of Surface

All surfaces which are to be waterproofed shall be reasonably smooth and free from projections or holes which might cause puncture of the membrane. The surface shall be dry so as to prevent the formation of steam when the hot pitch is applied and, immediately before the application of the waterproofing, the surface shall be thoroughly cleaned of dust and loose materials.

No waterproofing shall be applied in wet weather or when the air temperature is below 35° F. unless vertical surfaces are heated and dried by salamanders, and horizontal surfaces are heated for one to two hours with a two-inch layer of hot sand. After the concrete is warm and thoroughly dry, the sand shall be swept back as work progresses.

Plies of Membrane Required for Different Water Pressures

Head of Water in feet	Felt, Fabric, or Combined Felt and Fabric	
	Plies Required	Pitch Mopping Required
1-3	2	3
3-6	3	4
6-9	4	5
9-12	5	6
12-18	6	7
18-25	7	8
25-35	10	11
35-50	11	12
50-75	13	14
75-100	14	15

Application

1. Beginning at the low point of the surface, thoroughly mop a strip of concrete with Koppers Waterproofing Pitch. This mopping and all succeeding moppings on the concrete surface shall cover the concrete so that in no place shall gray spots be visible. Immediately following the first mopping, press the first strip of fabric into the hot pitch so that it is smoothly and firmly bonded to the concrete.

2. Mop the edge of the first strip of fabric and the adjacent strip of concrete with Koppers Waterproofing Pitch, and into the hot pitch press a strip of fabric so that it forms a two (2) inch side lap with the first strip.

3. Repeat the above application until one ply of fabric with two (2) inch laps has been laid over that portion of the surface designated by the waterproofing engineer.

4. Again starting at the low point of the surface mop the first layer of fabric with hot pitch so that all threads of the fabric are completely hidden by pitch and into this press a strip of fabric which has been cut so as to break joints at the middle, one-third or other portion of the width of the first ply of fabric, depending on the number of plies to be used.

5. Repeat the above application using full width fabric until two plies of fabric have been laid over the surface.

6. Apply the third and succeeding plies of fabric in the same way, making sure that fabric does not touch fabric in any place.

7. Mop the entire top with Koppers Waterproofing Pitch. The completed waterproofing shall be firmly bonded membrane, and fabric shall not be exposed in any place.

8. As soon as any portion of the waterproofing has been completed it shall be covered by the specified protection course—concrete, brick, tile or other suitable material.

General

LAPS—Each sheet of fabric shall overlap the preceding sheet not less than two (2) inches at the sides. End laps shall be staggered at least twenty-four (24) inches from the end lap of the preceding ply.

End laps shall be not less than ten (10) inches wide.

The waterproofing shall be applied so that the direction of the flow of water is over and not against the laps.

Laps which have been exposed for any length of time shall be carefully examined for defects before connecting with other fabric and where any defects or insufficient lap areas are found the protection course shall be cut back sufficiently to give a proper lap between the membrane in place and the new work which is being applied.

Details

All plies of fabric shall be rolled or pressed firmly into the hot pitch and shall be laid without wrinkles, buckles or kinks.

Pitch shall not be heated above three hundred and seventy-five (375°) degrees F.

All wall angles, corners or any place where, in the opinion of the engineer or architect, the waterproofing course may be subject to unusual strain there shall be applied on the water pressure side not less than two (2) additional reinforcement plies of fabric and moppings of pitch.

Insulate all hot water and steam pipes which project through or are near the surfaces to be waterproofed so as to prevent injury to the waterproofing. Extra plies of fabric and other precautions should be taken to prevent water from getting between the waterproofing and the waterproofed surface at all points where the membrane is penetrated by drains, pipes, etc.

Plies of Koppers Tar Saturated Fabric or Koppers Approved Tarred Felt	Alternate Moppings of Koppers Waterproofing Pitch Required	Pounds of Pitch Required to Complete Each 100 sq. ft. of Waterproofing
2	3	105
3	4	140
4	5	175
5	6	210
6	7	245

All membrane waterproofing shall be applied by an experienced waterproofing contractor.

WOOD FLOOR WATERPROOFING

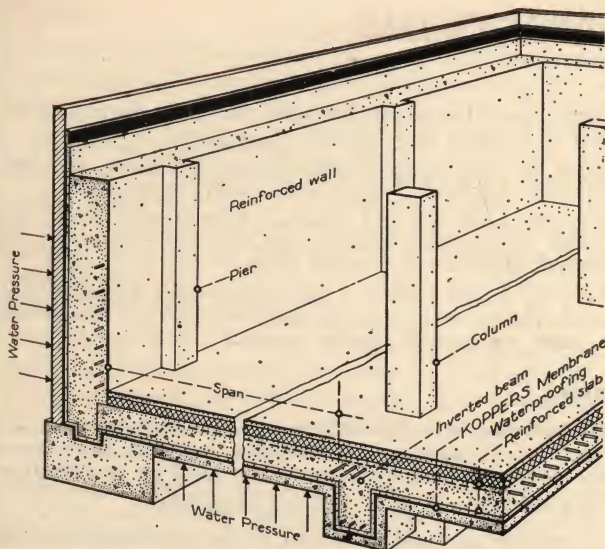
Lay over the entire surface two (2) thicknesses of red rosin paper (weighing not less than five (5) pounds per one hundred (100) square feet), lapping each sheet nineteen (19) inches over the preceding sheet. Nail to hold in place.

Lay one (1) thickness of Koppers Approved Tarred Felt with two (2) inch side laps and six (6) inch end laps and nail as required to hold in place.

Mop the entire surface with Old Style Pitch and into the pitch lay one (1) ply of Approved Tarred Felt with side laps of two (2) inches and end laps of six (6) inches. All laps shall be mopped

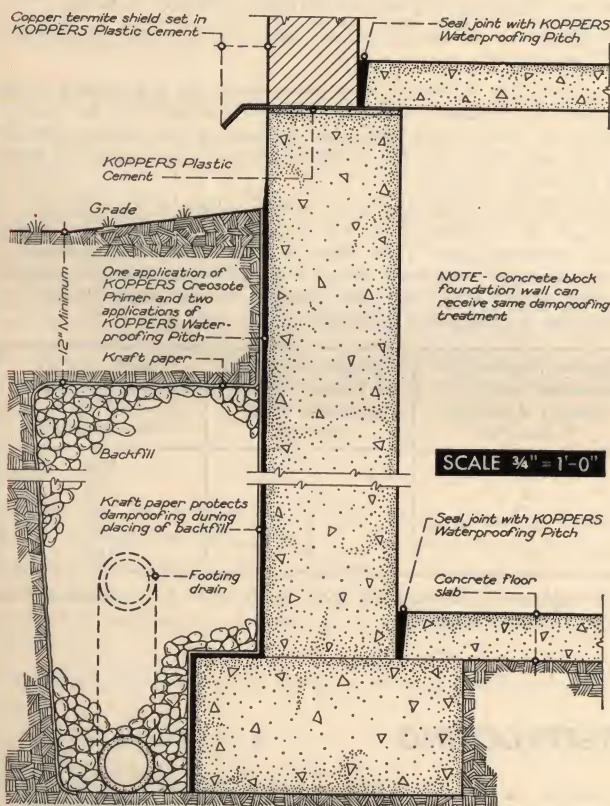
so that in no place does felt touch felt. The entire surface shall then be mopped with pitch and the floor plank shall be embedded in the hot pitch.

At corners and angles two additional plies of felt shall be installed, alternately mopped and run up the walls, etc., not less than three (3) inches above the level of the finished flooring, where they shall be fastened securely and protected. The finished flooring shall be nailed to the embedded plank immediately. Nails of suitable length shall be used to avoid penetrating through planks into the waterproofing.



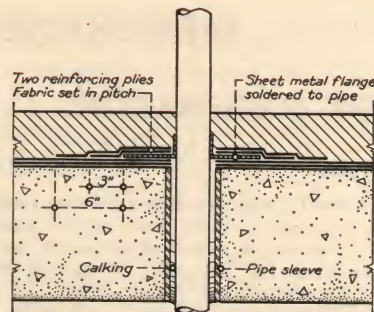
PRESSURE FROM HYDROSTATIC HEAD

The drawing shows a perspective section through a typical foundation which is reinforced against hydrostatic head. Vertical walls must be designed for a lateral thrust and the floor is shown reinforced against upward thrust. Where feasible a drainage system will relieve water pressure and may make it possible to reduce the hydrostatic head considerably and so reduce the cost of construction. A static head of water will exert a pressure of 62½ pounds per square foot for each foot of height of the water. During the construction the water pressure must be relieved by pumping until the concrete work has been placed and has developed its design strength.



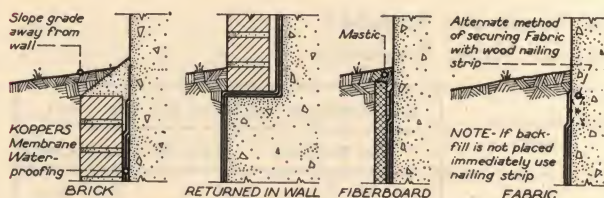
TYPICAL BASEMENT DAMPPROOFING

The dampproofing of basement floors where no static head exists may be accomplished through the use of a primer and two moppings of waterproofing pitch. A strong kraft paper, applied shingle fashion, should be used to protect the dampproofing during the placing of the backfill. A kraft paper lining of the backfill trench will prevent a silting of the porous material which might render it ineffective in time.



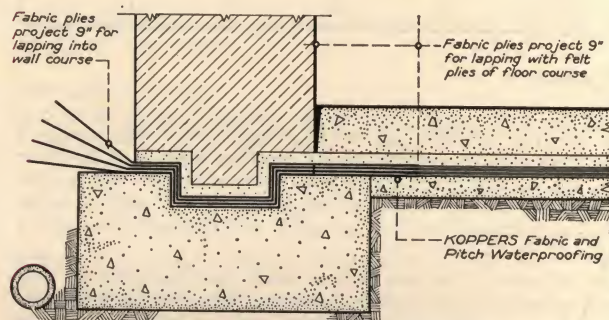
PIPE SLEEVES THRU MEMBRANE

Sleeves must be provided for pipes, conduits and other penetrations through membrane waterproofing. Hot water and steam pipes must be insulated where they pass through or near membrane to prevent injury. Penetration of piping should be avoided unless necessary since movement of the structure can destroy the water-tightness.



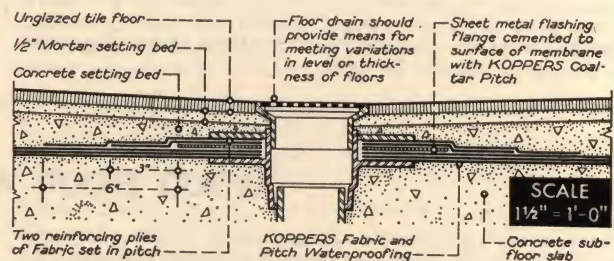
TERMINATIONS OF MEMBRANE AT GRADE

A protection course is used to protect the membrane waterproofing against damage, particularly during the backfilling operation. Backfill which contains no sharp or extremely heavy particles will not injure the membrane once the job is completed. The termination of the membrane at grade is shown here.



FABRIC THRU KEY JOINTS

Where the sequence of work requires an interruption in the installation of waterproofing membrane, such as key joints underwalls, plies of fabric are left projecting as shown and are provided with temporary protection. When the new surface is erected the projecting plies are lapped into the membrane of the new surface with coal tar pitch moppings.



MEMBRANE AT FLOOR DRAINS

Floor drains used in water-tight floors or promenade decks should be of a type equipped with a metal flashing flange which is cemented to the surface of the membrane with a mopping of coal-tar pitch. Over the flange with alternate moppings 2 reinforcing plies of tarred fabric are applied as shown.

POURED CONCRETE FLOOR WATERPROOFING

Lay over the entire surface two (2) thicknesses of Approved Tarred Felt, lapping each sheet nineteen (19) inches over the preceding sheet, mopping the full width of the lap with Old Style Pitch so that in no place does felt touch felt. Then coat the entire surface with Old Style Pitch. Not less than seventy (70) pounds of pitch shall be used for completing the waterproofing on each one hundred (100) square feet of surface.

At all corners and angles two additional plies of felt shall be installed and mopped similarly and these shall be carried up the walls, etc., not less than three (3) inches above the level of the finished flooring where they shall be fastened securely and protected. The finished flooring shall be installed immediately.

SPANDREL AND WALL WATERPROOFING

Every building of masonry construction should have adequate flashings built through the walls to impede the movement of moisture through inter-connecting voids in the masonry. These flashings protect spandrel beams, reinforcing steel, steel window and door frames against corrosion. Coating the interior surfaces of all exterior walls with Koppers Waterproofing Pitch or Koppers Damp-proofing Paint produces a moisture-repellent film between the structural walls and furring.

Specification

In all places where spandrel waterproofing is detailed two (2) plies of Koppers Tarred Fabric set in two (2) trowel coatings of Koppers Plastic Cement shall be constructed. All flashing shall terminate one-half (½) inch from wall exteriors.

The interior surfaces of all exterior walls shall be brushed or sprayed with Koppers Concrete Priming Oil, using one (1) gallon

for each two hundred (200) square feet. Eight (8) to twenty-four (24) hours later the well primed surfaces shall be mopped with Koppers Waterproofing Pitch. Two (2) coatings using a total of thirty (30) pounds of pitch for each one hundred (100) square feet shall be applied, permitting the first coating to cool before applying the second.

Alternate

(To be used in place of pitch moppings.)

Two coatings of Koppers Dampproofing Paint shall be applied by brush or spray using not less than one (1) gallon for each one hundred and fifty (150) square feet of surface and permitting the first coating to dry for not less than three (3) hours before making the second application.

DAMPPROOFING METHODS

PITCH METHOD—DAMPPROOFING AND TERMITE PROOFING

Uses

For all brick or concrete foundations and abutments where back-fill will be used.

SPECIFICATIONS

Application

The surfaces should be free from all dirt. All cracks should be thoroughly wetted with water and then filled with Portland Cement Mortar.

1. Over the entire surface to be dampproofed, apply a uniform brush coat of Koppers Concrete Priming Oil. Approximately one (1) gallon should be used for each one hundred (100) square feet.
2. Apply a mopping of Koppers Waterproofing Pitch. Approximately twenty-five (25) pounds per one hundred (100) square feet shall be used and the pitch shall be heated to a temperature at

which it is entirely liquid, but this temperature shall not exceed three hundred and seventy-five (375°) degrees F.

3. A second mopping of Waterproofing Pitch shall then be applied over the entire surface of the first mopping. Approximately twenty-five (25) pounds per one hundred (100) square feet shall be used so that the entire amount of pitch applied shall amount to a total of approximately fifty (50) pounds per one hundred (100) square feet.

4. The permanent back-fill shall be tamped into place immediately after the last mopping is applied.

5. For additional protection against termites, coal tar pitch seals shall be provided at all places where floor slabs join foundation walls and between adjacent slabs. Seals shall be completely filled with Koppers Waterproofing Pitch. Also 20 oz. copper shields set in Koppers Plastic Cement shall be installed on top of all foundation walls.

NOTE: Use Koppers Membrane Waterproofing when a head of water is encountered.

HIGH PENETRATION METHOD—DAMPPROOFING

Uses

Koppers HP Primer is used with Koppers Seal Coat for protecting cement concrete against the disintegrating action of water.

Concrete is permanent only when it is protected from the alkalis and sulphates often found in ground, lake, and sea waters. Con-

tinued contact with water also changes the structure of some of the chemical constituents of cement concrete, thus causing the concrete to lose some of its inherent strength. Koppers HP Primer penetrates the surface of the concrete, making it water-repellent. Koppers Seal Coat seals the surface, thus protecting it from erosion.

(Continued next page)

DAMPPROOFING METHODS (continued)

HIGH PENETRATION METHOD (Continued)

This treatment is used particularly for dampproofing foundations, bridge abutments, basement and retaining walls, culverts, reservoirs, dams, sumps, pits, vats, tanks, and sewage disposal plants. On reinforced concrete this treatment also gives added protection to the reinforcing steel.

SPECIFICATIONS FOR POURED CONCRETE

NOTE: The concrete need not be thoroughly dry. Application of the HP Primer can begin as soon as forms are removed.

Application

1. Apply with a brush, or spray a uniform coating of Koppers High-Penetration Primer over the entire surface to be protected. This first coating usually is absorbed as applied.
2. Immediately apply in the same manner another coating of Koppers High-Penetration Primer over the first coating, allowing this coating to penetrate into the concrete.
3. Repeat the same application as described under No. 2 until four (4) coatings have been applied. The last coatings may require one (1) or two (2) hours to be absorbed.
4. Apply over the entire surface with a brush one (1) application of Koppers Seal Coat. This material shall be applied at a tempera-

ture from about eighty (80) to one hundred (100) degrees F. Allow the Koppers Seal Coat to dry thoroughly before disturbing the job.

The application according to this specification will require about two (2) gallons of Koppers High-Penetration Primer and approximately one-half ($\frac{1}{2}$) gallon of Koppers Seal Coat per one hundred (100) square feet.

Superstructure—On masonry superstructure exteriors, such as parapet walls, walls of buildings, etc., Koppers Lumino is used over HP Primer to give the surface an aluminum finish. Send for the Koppers folder on tar-base paints.

SPECIFICATIONS FOR PRECAST CONCRETE

The precast piles or slabs shall be reasonably dry.

1. Prepare a bath of Koppers High-Penetration Primer large enough to accommodate the precast units and completely immerse these units for at least thirty (30) minutes, then remove the units from the bath and allow to drain and dry thoroughly.
2. Apply a coating of Koppers Seal Coat, brushing thoroughly into the surfaces. The Seal Coat shall be applied at a temperature of from eighty (80) to one hundred (100) degrees F. Allow the Seal Coat to dry before disturbing the job.

SUB-FLOOR TAR DAMPPROOFING

Uses

In basements where the ground is damp and it is desired to use a wood finish floor, an effective dampproofing is necessary.

Specifications

The earth should be leveled off to proper grade. If earth or cinder fill is used it should be puddled and rolled or tamped to thoroughly compact it. The sub-base may be either a cement-concrete slab installed in the usual way, or a slab of Koppers No. 2 Sub-Floor Tar Concrete. A cubic yard of crushed stone or gravel passing a $2\frac{1}{4}$ inch sieve but retained on a $\frac{1}{4}$ inch sieve is mixed with approximately 10 gallons of Koppers No. 2 Sub-Floor Tar which has been heated. This should be thoroughly rolled or tamped and brought to accurate grade.

The dampproofing course is placed over the slab. One cubic yard of clean torpedo sand is heated (210° to 250° F.) and mixed with 25 to 30 gallons of Koppers No. 1 Sub-Floor Tar at the same temperature. The mixture is spread evenly over the slab to a thickness of from $1\frac{1}{4}$ inches to $1\frac{1}{2}$ inches and leveled with a straight edge.

Well dried or treated planks are laid on this soft mixture before it cools and bedded by hammering, so that the coating compacts to a thickness of 1 inch. If any plank is hammered below level, it is raised and more of the mixture applied beneath it. After the planks have been brought to proper level they are toenailed together.

The sub-floor planks are preferably pressure treated with coal tar creosote meeting the Grade 1 specifications of the American Wood Preservers' Association. In food factories, creameries, etc., where the odor of creosote might be objectionable, the planks should be treated with a suitable salt preservative such as zinc chloride or Wolman salts. Planks to be creosoted should be dried before treatment. When a salt preservative is used, the planks should be dried after treatment, whether or not they were dried before treatment.

The finish floor is then laid at right angles or diagonal to the planks in the usual manner.

NOTE: Koppers produces creosote, and treats wood with creosote, zinc chloride and Wolman salts. Complete information about creosote or treated lumber sent on request.

APPLICATIONS OF DAMPPROOFING PAINT TO CONCRETE IN GENERAL

As soon as the cement has taken its initial set, (. . . spray . . . or . . . brush) a coating of dampproofing paint over the entire surface.

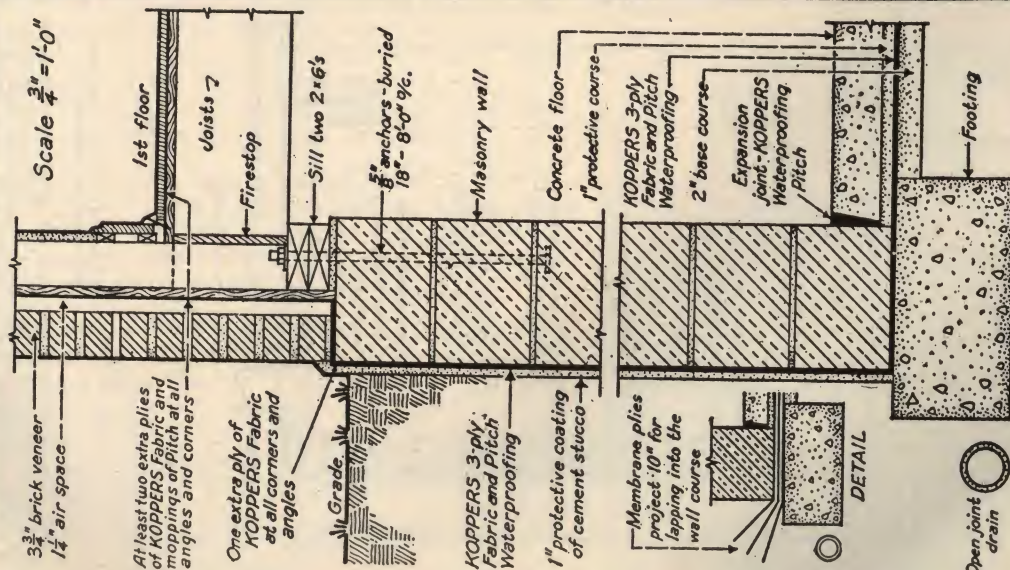
Apply a second coat of Koppers Dampproofing Paint not less than 6 nor more than 24 hours after the first application. For each application use 1 gallon of paint per coat for each 100 square feet of surface covered.

Koppers Dampproofing Paint may be applied to green as well as dry concrete. Green concrete painted with this dampproofing paint does not require sprinkling with water for curing.

Because it is impossible to make a perfect application with a single coat of paint, two coats are recommended.

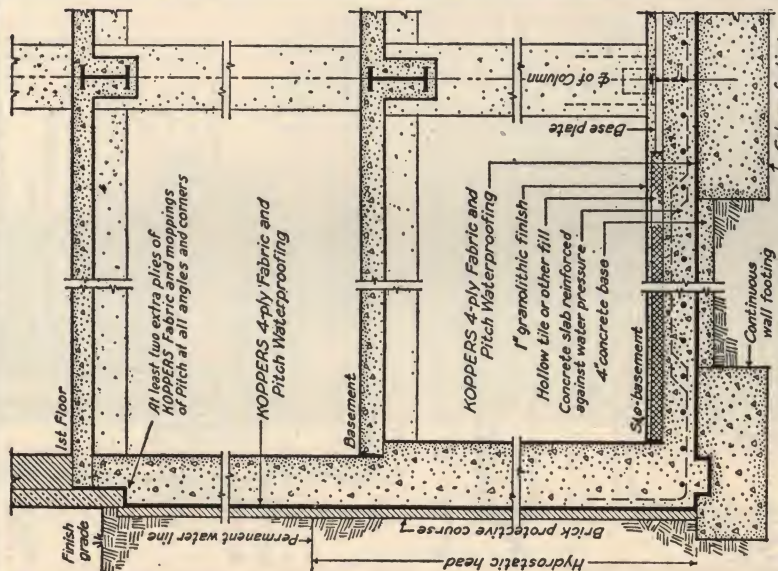
PENCIL POINTS DATA SHEETS
**WATERPROOFING OF
RESIDENCE FOUNDATIONS**
Prepared by Don Graf, B.S., M.Arch.

Sheet No.
F9



PENCIL POINTS DATA SHEETS
**WATERPROOFING OF
DEEP FOUNDATIONS**
Prepared by Don Graf, B.S., M.Arch.

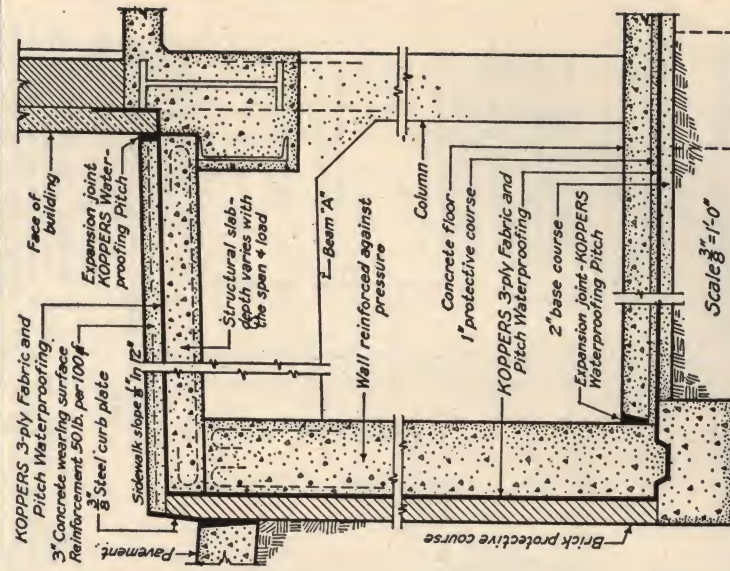
Sheet No.
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In the construction of deep basements having unfavorable water conditions, the waterproofing method is shown here. The Koppers 4-ply Fabric and Pitch Waterproofing membrane will withstand a hydrostatic head up to 18'. From 18' to 25' 5 plies are used. A sheet of 20-oz. soft rolled copper should be placed between the plies beneath all columns, posts or walls under which the pressure exceeds 400 lbs. per sq. inch. The sub-basement floor is reinforced as a flat slab to resist the upward pressure of the water. Inverted beams may be used, but these necessitate a greater amount of fill to bring the construction to a level to receive the wearing surface. If plies are used, the footings shown above become the pile cap-pings. No dowels need be run through the membrane.

PENCIL POINTS DATA SHEETS
**WATERPROOFING OF
SIDEWALK VAULT**
Prepared by Don Graf, B.S., M.Arch.

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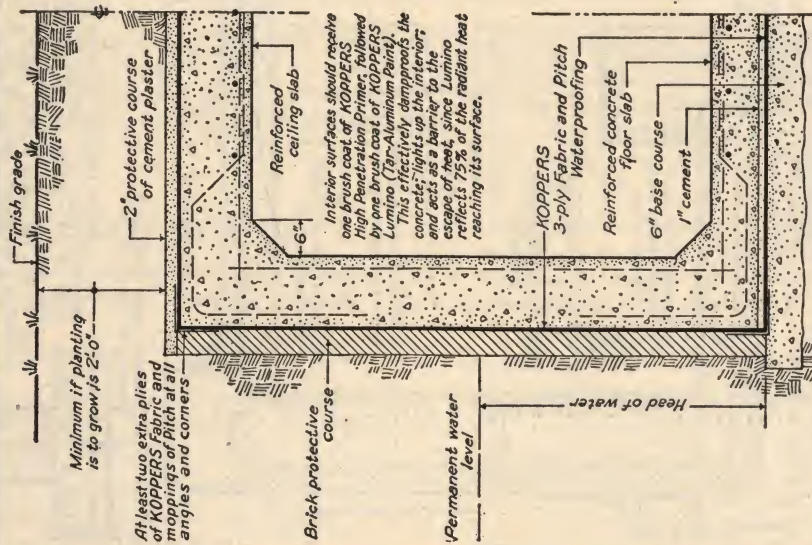


The problem involved in constructing sidewalk vaults is to provide for movement of the concrete to eliminate cracking, and at the same time to exclude water so that the space may be usable. A 1" expansion joint should occur at the building line as shown. Others should occur at proper intervals at right angles to the building face as shown in the detail at the left. The membrane acts as a flexible dam in the joint, retaining the filling of pitch. To facilitate the movement of the slabs, 2 dry plies of Koppers Tarrd Felt are placed between the bottom of the slab and its bearing surface on beams or wall, thus breaking the joint.

Sheet No.
F9

PENCIL POINTS DATA SHEETS
**SUBTERRANEAN TUNNEL
TO CONNECT BUILDINGS**

Prepared by Don Graf, B.S., M.Arch.

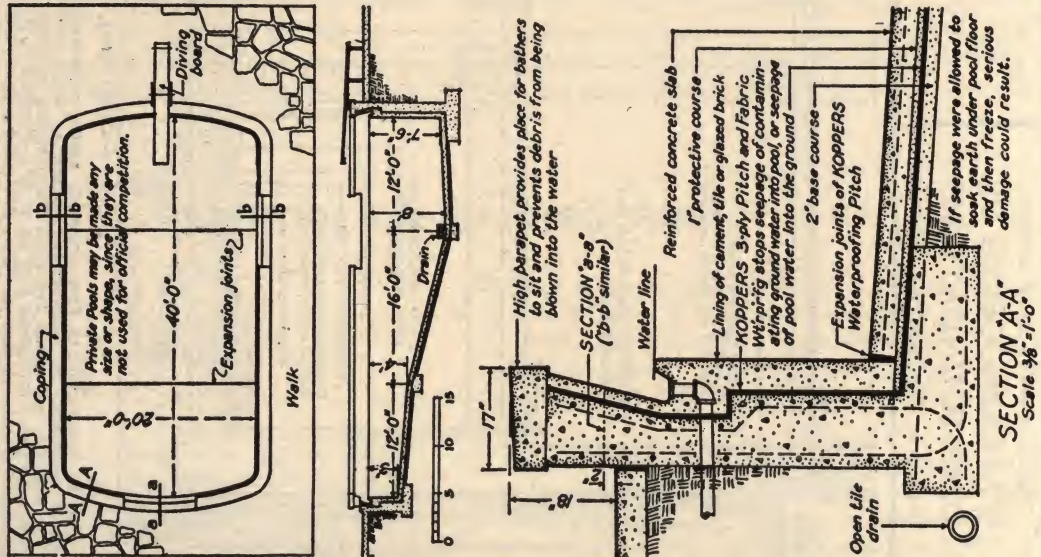


Frequently it is necessary to construct subterranean tunnels from one building to another, either for a passageway for circulation of people, or as a conduit to contain pipes and ducts. If the soil will retain ground water, or if the passage extends below the permanent water level, an effective waterproofing is necessary as shown above. This forms an unbroken envelope through which moisture is unable to penetrate. The thickness of the floor slab and the reinforcing will depend upon the span and the head of water to be resisted. The thickness and reinforcing of the walls depend upon the height and the water head. The detail of the roof or ceiling slab will depend upon the span and the weight of earth to be sustained.

Sheet No.
D2

PENCIL POINTS DATA SHEETS
**SMALL OUTDOOR
SWIMMING POOL**

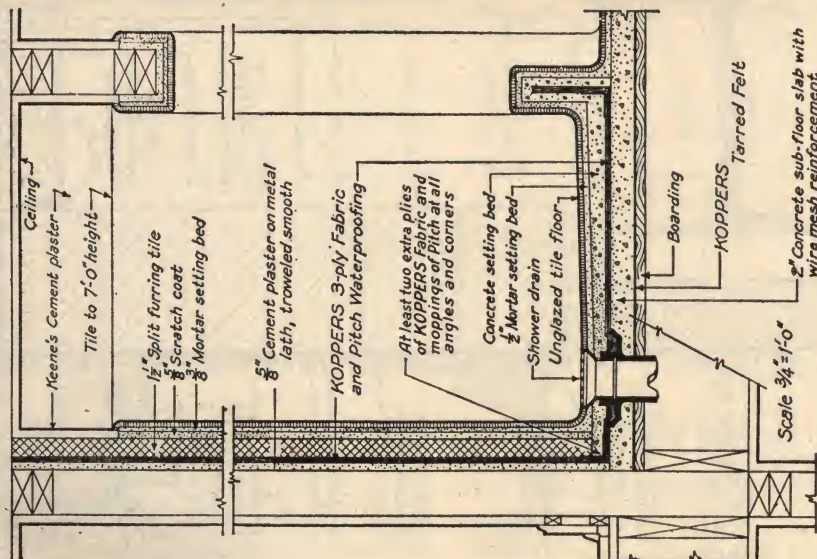
Prepared by Don Graf, B.S., M.Arch.



Sheet No.
D6

PENCIL POINTS DATA SHEETS
**SHOWER BATH
CONSTRUCTION**

Prepared by Don Graf, B.S., M.Arch.



The usual sizes for shower stalls are as follows:—30 x 36, 30 x 42, 36 x 36, 36 x 42, 42 x 42. Where space permits, the largest size given is desirable. Showers less than 36 x 36 in the clear should only be planned when space conditions make it mandatory. The door opening may be closed either with a water-proof curtain or any of the standard shower stall doors having ventilating panels. The floor of the shower should be of an unglazed or abrasive tile, to prevent slipping. Glazed or unglazed tiles may be used for the walls at the discretion of the designer. Floor drains vary from 1 1/2" to 3" wastes. The larger the better.

KOPPERS PLASTIPITCH PROTECTED METAL

Corrugated Roofing and Siding; Flat Sheets; V-Crimp Sheets

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6

Koppers Plastipitch Protected Metal consists of flat, corrugated, or V-crimp sheets coated by a process developed by Koppers Company, Inc., with a unique pitch compound known as Koppers Plastipitch.

Because of the nature of the materials from which Plastipitch compound is made, plus the technical and plant skill with which the materials are produced, the Plastipitch coating possesses qualities which make it the ideal bituminous coating for steel sheets for industrial and agricultural buildings. This coating adheres tenaciously to metal at low as well as high atmospheric temperatures.

Plastipitch Protected Metal is used for roofing and siding, and for the manufacture of gutters, ventilators, flashings, ducts, etc.

Steel must be protected against weathering in order

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Complete data and specification catalog will be sent upon request.



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Experience has shown that ordinary paints do not stand up against the severe corrosive conditions to be found in industry today and that effective corrosion control—with its accompanying lower maintenance costs—can be accomplished only by treating corrosion as a special problem to be solved by specialized materials.

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Typical application of Koppers Protective coatings.

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